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AUTHOR Eggett, A. J.
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ABSTRACT

This packet consists of 22 student learning guides for high school vocational education students in Illinois. The guides contain tasks for a course in electricity/electronics. Each task guide identifies the task and its purpose and provides a learning contract for the student and teacher to sign. Information on the learning contract consists of a terminal performance objective and microperformance objectives. For each microperformance objective, learning steps are listed, along with resources to complete the steps. Some task guides contain information sheets and some contain evaluation sheets with answers. Topics covered in the guides include the following: safety practices in the use of electrical tools and equipment, schematics, hand tools, soldering, basic electricity, Thevenin's and Norton's theorems, alternative power sources, Ohm's Law and power, electrical measurements, resistors and resistance, series resistive circuits, parallel resistive circuits, magnetism, electromagnetism, audio signal generators, inductance, capacitive circuits, RLC circuits, AC power, and semiconductors. (Some topics are covered in more than one task guide.) The task guides are designed for use in a competency-based individualized course. (KC)

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COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

CIVEC
301 N. Swift Road
Addison, Illinois 60101
312/620-8770

Produced By
James Eggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

IDENTIFY SAFETY PRACTICES TO BE OBSERVED IN THE USE
OF ELECTRICAL TOOLS AND EQUIPMENT.

Purpose

In order to insure a safe learning and work environ-
ment, the student electrician and electronics
technician must observe safety practices while
using tools and equipment. This guide will enable
you to identify these safety practices and safely
operate electrical tools and equipment.

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BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
E/E	103	4 hours	none

3/82

CE237746

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

4 hours

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN THE ELECTRICITY CONCEPTS TRAINER AND LABORATORY AREA, IDENTIFY SAFETY PRACTICES TO BE OBSERVED IN THE USE OF ELECTRICAL TOOLS AND EQUIPMENT. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN EXAM WITH A MINIMUM SCOPE OF 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify electrical shock hazards.
2. Identify short circuit hazards.
3. List general safety hazards.
4. Identify safety practices.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature _____

DEPT	PROG	TASK	TPO
E/E	100	103	103

Instructor's Signature _____
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY ELECTRICAL SHOCK HAZARDS

LEARNING STEPS

1. View resource #1 to acquaint you with the dangers and safety precautions associated with the electronics laboratory.
2. Read resource #2 to establish the meaning of a short circuit and the hazards of a short circuit.
3. Complete resource #3 to insure understanding of material.
4. Complete resource #4 after approval of your instructor.

RESOURCES

1. Videotape E/E 100-001, "Lab Safety" - from learning resource center (LRC).
2. Textbook: Electricity Concepts Unit I, pp. 1-1 to 1-2 on your workbench.
3. Electricity Concepts Unit I, questions on p. 1-3 (see instructor for answer sheet).
4. MPO #2 this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	103	103	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY SHORT CIRCUIT HAZARDS

LEARNING STEPS

1. Read resource #1 to gain an understanding of causes of shock and shock prevention measures.
2. Complete resource #2 to ensure an understanding of the material.
3. Complete resource #3 after approval of your instructor.

RESOURCES

1. Electricity Concepts Unit I, pp. 1-4 to 1-7 on your workbench.
2. Electricity Concepts Unit I, questions on p. 1-8 (see your instructor for answer sheet).
3. MPO #3 this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	103	103	002

MICRO - PERFORMANCE OBJECTIVE #3

LIST GENERAL SAFETY HAZARDS

LEARNING STEPS

1. Read resource #1 for an understanding of circuit protection devices and hazards of a laboratory.
2. Complete resource #2 to ensure an understanding of material.
3. Read resource #3 to learn common do and don't items for an electronics lab.
4. Complete resource #4 after approval of your instructor.

RESOURCES

1. Electricity Concepts Unit I, pp. 1-9 to 1-10, located on your workbench.
2. Electricity Concepts Unit I, questions on p. 1-11 (see your instructor for answer sheet).
3. Information sheet #103-003-001.
4. MPO #4 this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	103	103	003

INFORMATION SHEET

(103-003-001)

SAFETY CHECKLIST COVERING COMMON DO AND DON'T ITEMS FOR
AN ELECTRONICS LABORATORY.

Be aware of shock hazards:

- One hand in pocket
- Don't wear conductive jewelry
- Don't work while wet or barefoot
- Don't bring drinks into lab area

Never work alone in lab:

- Know what to do to help shock victim
- Get help lifting heavy objects

Work with your instructor:

- Ask questions before proceeding
- Report all accidents to him

Be familiar with your equipment:

- Be sure it's in safe condition
- Use the right tool for the job
- Know where burn and fire hazards exist and where fire extinguishers are
- Use caution around moving machinery (motors and fans)

Use extreme caution while working on live circuitry:

- Work on live equipment only when absolutely necessary
- Use insulated tools (keep one hand in pocket)

Keep your work area neat:

- Shut off all equipment when leaving

No horseplay in lab:

- Don't distract other students

Be careful:

- Take your time, think first, plan ahead
- Consider the consequences

DEPT.	FROG	TASK	TPO	MPO
E/E	100	103	103	003

MICRO - PERFORMANCE OBJECTIVE #4

IDENTIFY SAFETY PRACTICES

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-3, this SLG.
2. Criterion exam #E/E-100-103-001 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	103	103	004



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A LEARNING GUIDE

Task

IDENTIFY ELECTRONIC PARTS AND SYMBOLS IN A SCHEMATIC

Purpose

An Electrician/Electronics Technician must be able to read a schematic in order to determine the circuit characteristics and operation of electrical/electronic equipment. This learning guide will enable you to identify parts, symbols and correct wiring procedures, ensuring your ability to locate and troubleshoot defective components in the equipment utilizing a schematic diagram.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	106	8 hours	103

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

8 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, IDENTIFY TRAINER COMPONENTS, PROPER WIRING PROCEDURES AND SYMBOLS AND PARTS. MASTERY WILL BE DETERMINED BY PASSING A WRITTEN CRITERION EXAM WITH A SCORE OF 16 OUT OF 20 OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify trainer components.
2. Identify proper wiring procedures.
3. Identify symbols and parts.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	IPO
E/E	100	106	106

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY TRAINER COMPONENTS

LEARNING STEPS

1. Read resource #1 to learn the individual electrical components of the Electricity Concepts Storage Board.
2. Complete resource #2 to inventory components.
3. Complete resource #3 to test your comprehension of the material.
4. After approval of instructor, go to resource #4.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 2-1 to 2-2, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 2-2 to 2-4, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 2-5, in LRC (see instructor for answer sheet).
4. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	106	106	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY PROPER WIRING PROCEDURES

LEARNING STEPS

1. Read resource #1 to learn the procedures involved with good wiring.
2. Complete resource #2 to test your comprehension of this material.
3. After approval by instructor, go to resource #3.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 2-17 to 2-19, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 2-20, in LRC (see instructor for answer sheet).
3. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	106	106	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY SYMBOLS AND PARTS

LEARNING STEPS

1. Read resource #1 to learn the names and schematic symbols of the electrical components.
2. Complete resource #2 to identify electrical components.
3. Complete resource #3 to test your comprehension of the material.
4. Review resource #4 to prepare for criterion exam.
5. Complete resource #5 to check your understanding of this task.
6. Return this learning guide to resource #6.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 2-6 to 2-11 in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 2-12 to 2-13 in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 2-14 to 2-16 in LRC. (See instructor for answer sheet).
4. MFO #1, #2, and this learning guide.
5. Criterion exam, E/E-100-106 from instructor.
6. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	106	106	003



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A. J. Waggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

USE HAND TOOLS

Purpose

The electrician/electronic technician will be required to replace/install circuit components using hand tools. This guide will enable you to identify and gain practical experience using these hand tools.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	109	8 hours	NONE

5-82

LEARNING CONTRACT

1 STUDENT DATA

NAME

8 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN STANDARD TOOLS FROM THE TOOL CABINET AND HOOKUP WIRE, USE HAND TOOLS. TO MASTER THIS TASK, YOU WILL SCORE 10 OUT OF 20 OR 80%, ON A WRITTEN CRITERION EXAM AND 9 OUT OF 10, OR 90%, ON A PERFORMANCE CHECKLIST.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify hand tools.
2. Identify types of hookup wire.
3. Use hand tools.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
N/E	100	107	102

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY HAND TOOLS

LEARNING STEPS

1. Read resource #1 to determine quality tools and safe usage.
2. Complete resource #2 to test your understanding of new material.
3. Contact resource #3 to pick up tools from the tool cabinet.
4. Read resource #4 to become familiar with the tools issued to you.
5. Go on to resource #5.

RESOURCES

1. Residential Wiring by G. Rockis, pp 21-35, in LRC.
2. Residential Wiring by G. Rockis, pp 37-40, (self check answers in back of book), in LRC.
3. Instructor.
4. Basic Electricity by P.B.Zbar, pp 10-11, in LRC.
5. MPO #2, this guide.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	109	109	001

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY TYPES OF HOOKUP WIRE

LEARNING STEPS

1. Contact resource #1 to procure different types of hookup wire.
2. Read resource #2 to understand uses of hookup wire.
3. Complete resource #3.

RESOURCES

1. Instructor.
2. Basic Electricity by P.B.Zbar, pp 11-12, in LRC.
3. MPO #3, this guide.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	109	109	002

MICRO - PERFORMANCE OBJECTIVE #3

WIRE HAND TOOLS

LEARNING STEPS

1. Complete resource #1 for hand-tool familiarization and wire preparation.
2. Complete resource #2 to demonstrate proper use and identification of hand tools.
3. Review resource #3 to prepare for criterion exam.
4. Complete resource #4 to check your understanding of this task.
5. Return packet to resource #5.

RESOURCES

1. Basic Electricity by P.B.Zbar, perform Procedures, p 13, in LRC.
2. Performance Checklist #109, this guide.
3. MPO #1-3, this SLG.
4. Criterion Exam, # E/E-100-109, from Instructor.
5. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	109	109	003

PROGRAM: 100

TASK: USE OF HAND TOOLS

TASK # 109

PERFORMANCE/PRODUCT CHECKLIST

STUDENT'S NAME _____ EVALUATION SITE _____

EVALUATOR'S NAME _____ PERFORMANCE ATTEMPT 1 2 3 4

DATE OF ATTEMPT _____

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN STANDARD TOOLS FROM THE TOOL CABINET AND HOOKUP WIRE, USE HAND TOOLS.

DIRECTIONS TO THE STUDENT:

BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE BASIS OF THIS CHECKLIST. WHEN YOU FEEL YOU ARE READY FOR EVALUATION CONTACT YOUR INSTRUCTOR. YOU MUST COMPLETE YOUR PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE AT LEAST 90 OUT OF 100 POINTS OR 90 % FOR MASTERY. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED.

DIRECTIONS TO THE EVALUATOR:

THE STUDENT WILL CONTACT YOU WHEN READY FOR EVALUATION. THE STUDENT MUST COMPLETE THE PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE 90 OUT OF 100 POINTS OR 90 % AND ALL ITEMS MARKED WITH AN ASTERISK (*) MUST BE SATISFACTORILY COMPLETED.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	109	109	003



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Produced By
A. J. Eggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task DEMONSTRATE SOLDERING TECHNIQUES

Purpose To be able to build an electronic circuit (i.e. radio, alarm systems, transmitter, etc.) you must be able to properly solder and unsolder connections. This guide will provide the information to perform this task and you will demonstrate your ability to perform this task.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	112	8 hours	NONE

1/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

8 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A SOLDERING IRON, WIPE, BOARD WITH TERMINAL STRIPS, PRINTED CIRCUIT BOARD, SOLDER, HAND TOOLS AND LAB AREA, IDENTIFY MATERIALS AND PREPARATION, SOLDERING TECHNIQUES, AND EMERGENCY REPAIR TECHNIQUES. MASTERY WILL BE DEMONSTRATED BY A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 80% AND A SCORE OF 80% ON THE PERFORMANCE CHECKLIST WHICH MUST BE COMPLETED IN 120 MINUTES OR LESS.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify materials and preparation for soldering.
2. Identify soldering techniques.
3. Identify emergency repair techniques.
4. Demonstrate soldering techniques.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	112	112

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY MATERIALS AND PREPARATION FOR SOLDERING

LEARNING STEPS

1. Read resource #1 to learn what tools and materials are required and the basic procedures of soldering.
2. View resource #2 to learn the basics of electronic soldering.
3. Complete resource #3 to test your understanding of the material.
4. Proceed to resource #4.

RESOURCES

1. Basic Electricity 4th Edition by Zbar, pp. 15-17, in LRC.
2. Film loop: #E/E-100-033, Soldering for Electronics, Part I, "Materials and Preparation" by M. Fenwich (see instructor for written narrative of film loop), in LRC.
3. Review questions on "Basic Soldering for Electronics" Part I, from instructor.
4. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	112	112	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY SOLDERING TECHNIQUES

LEARNING STEPS

1. Read resource #1 to learn types of connections requiring soldering.
2. View resource #2 to learn the correct procedure of soldering.
3. Complete resource #3 to test your understanding of the material.
4. Go to resource #4.

RESOURCES

1. House Wiring Simplified by Mix, pp. 72-73, in LRC.
2. Film Loop: #E/E-100-034 Part II, "The Do's and Don'ts of Soldering" by Milner Fenwick, in LRC. (See instructor for written narrative of film loop).
3. Review questions on "Basic Soldering for Electronics" Part II from instructor.
4. MFO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	112	112	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY EMERGENCY REPAIR TECHNIQUES

LEARNING STEPS

1. View resource #1 to learn emergency methods for repairing broken printed circuits.
2. Complete resource #2 to test your understanding of the material.
3. Review resource #3 to prepare for criterion exam.
4. Complete resource #4 to check your comprehension of task.
5. Proceed to resource #5 on instructor's approval.

RESOURCES

1. Film loop: #E/E-100-035, Part III "Emergency Repair Techniques" by Milner Fenwich, in LRC. (See instructor for written narrative of film loop).
2. Review questions on "Basic Soldering for Electronics" Part III, from instructor.
3. MPO #1, 2 and above material.
4. Criterion exam: #E/E-100-112, from instructor.
5. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	112	112	003

MICRO - PERFORMANCE OBJECTIVE #4

DEMONSTRATE SOLDERING TECHNIQUES

LEARNING STEPS

1. Review resource #1 to prepare for performance test.
2. Obtain equipment from resource #2 to perform task.
3. Complete resource #3 to practice this task.
4. When you feel you can perform this task without resources or assistance, perform for evaluation using resource #4.
5. Return packet to resource #5.

RESOURCES

1. MPO #1-3, this guide.
2. Instructor.
3. Basic Electricity 4th Edition by Zbar. Procedure pp. 18-22, in LRC.
4. Instructor using performance checklist #E/E-112, this guide.
5. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	112	112	004

PROGRAM: 100

TASK: DEMONSTRATE SOLDERING TECHNIQUES

TASK # 112

PERFORMANCE/PRODUCT CHECKLIST

STUDENT'S NAME _____ EVALUATION SITE _____

EVALUATOR'S NAME _____ PERFORMANCE ATTEMPT 1 2 3 4

DATE OF ATTEMPT _____

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN A SOLDERING IRON, WIRE, BOARD WITH TERMINAL STRIPS, PRINTED CIRCUIT BOARD, SOLDER, HAND TOOLS AND LAB AREA, IDENTIFY MATERIALS AND PREPARATION, SOLDERING TECHNIQUES AND EMERGENCY REPAIR TECHNIQUES.

DIRECTIONS TO THE STUDENT:

BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE BASIS OF THIS CHECKLIST. WHEN YOU FEEL YOU ARE READY FOR EVALUATION CONTACT YOUR INSTRUCTOR. YOU MUST COMPLETE YOUR PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE AT LEAST 80 OUT OF 100 POINTS OR 80 % FOR MASTERY. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED.

DIRECTIONS TO THE EVALUATOR:

THE STUDENT WILL CONTACT YOU WHEN READY FOR EVALUATION. THE STUDENT MUST COMPLETE THE PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE 80 OUT OF 100 POINTS OR 80 % AND ALL ITEMS MARKED WITH AN ASTERISK (*) MUST BE SATISFACTORILY COMPLETED.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	112	112	004

CRITICAL ITEMS	ITEMS TO BE OBSERVED OR CHECKED	RATING											
		YES	NO										
*	1. Soldering iron tip properly cleaned and tinned.	10											
*	2. Leads of components properly shaped and cut to length	10											
*	3. Noncorrosive 60/40 solder used to solder joints.	10											
*	4. Small wattage iron used to complete task.	10											
*	5. Good mechanical joints made before soldering.	10											
*	6. Proper amount of heat and solder applied when making solder joints (no cold solder joints or lifted printed circuit strips).	10											
*	7. Heat sinks used in soldering transistors and diodes.	10											
*	8. Faulty components properly removed/desoldered and replacement components are of proper value.	10											
*	9. Safety procedures followed at all times.	10											
*	10. Work area properly cleaned up and tools returned to tool locker.	10											
		TOTAL POINTS EARNED =											
		POINTS NEEDED FOR MASTERY = 80											
		TOTAL POINTS POSSIBLE = 100											
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DEPT.	PROG	TASK	TPO	MPO									
E/E	100	112?	112										



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A LEARNING GUIDE

Task EXPLAIN BASIC ELECTRICITY

Purpose In order to understand electricity/electronics, it is important to have a knowledge of the structure of matter, how electricity flows, and how this flow is measured. The information gained in this learning guide will be used daily in your study of electricity or electronics.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	115	16 hours	112

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) 16 hours

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, IDENTIFY THE STRUCTURE OF MATTER, CONDUCTORS AND INSULATORS, ELECTRICAL QUANTITIES AND EXPLAIN BASIC ELECTRICITY. TO MASTER THIS TASK, YOU MUST SCORE 16 OUT OF 20 OR 80% ON A WRITTEN CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify the structure of matter.
2. Identify conductors and insulators.
3. Identify electrical quantities.
4. Explain basic electricity.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	115	115

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY THE STRUCTURE OF MATTER

LEARNING STEPS

1. Read resource #1 to learn the vocabulary dealing with electricity.
2. View resource #2 to learn the basics of electricity.
3. Read resource #3 to learn the basic principles of the structure of matter.
4. Read resource #4 to learn how these principles are involved with the study of electricity.
5. Complete resource #5 to ensure an understanding of the material.
6. Complete resource #6 after approval of your instructor.

RESOURCES

1. Information sheet: #115-001, this learning guide.
2. Video tape: #E/E-100-001 "Introduction to Electricity" by Texas Instruments in LRC.
3. Electricity and Electronics by Gerrish and Dugger, pp. 7-12 in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 3-1 to 3-3 in LRC.
5. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions, p. 3-3, (see instructor for answer sheet).
6. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	115	115	001

INFORMATION SHEET

#115-001

"Vocabulary"

In this package you will be introduced to many new terms needed in the discussion and explanation of electricity. The learning and comprehension of these terms will enhance your understanding the basic concepts of electricity.

1. Electricity:

The flow of electrons through simple materials and devices.

2. Atom:

The smallest part into which an element can be divided and still retain the behavior of the element.

3. Element:

One of the 106 different substances which is the basic building block of all matter, and cannot be divided into simpler substances by chemical means.

4. Electron:

Negatively charged particles surrounding the nucleus of an atom which determine chemical and electrical properties of the atom.

5. Proton:

Particles in the nucleus of the atom which has a positive charge equal to the electron's negative charge.

6. Electrostatic force:

A force which exists between any two charged objects. If the two objects each have the same type of charge, the force is repulsion. If the two objects each have different types of charge, the force is an attraction.

7. Coulomb:

A large quantity of electrons that is convenient when working with electricity and equals 6.25 billion, billion electrons (or 6.25×10^8 electrons).

DEPT.	PROG	TASK	TPO	MPO
E/E	100	115	115	001

-continued-

INFORMATION SHEET-continued-
#115-001

"Vocabulary"

8. Ampere:

The unit of measure for current flow which equals 1 coulomb of electrons passing one point in a circuit in 1 second.

9. "Free Electrons":

Electrons which are not bound to a particular atom but circulate among the atoms of the substance.

10. Potential difference:

A measure of force produced between charged objects that move free electrons. Also called voltage or electromotive force. Symbol is E, unit is the volt (abbreviated V).

11. Power:

The rate at which work is done or the rate at which heat is generated (abbreviated P). The unit of power is the watt (abbreviated W), which is equal to 1 joule per second.

12. Resistance:

Opposition to current flow which is a lot like friction because it opposes electron motion and generates heat. Symbol R. Unit is the ohm (Ω).

13. Conductor:

A material with many free electrons that will carry current.

14. Insulator:

A material with very few free electrons. A non-conductor.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	115	115	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY CONDUCTORS AND INSULATORS

LEARNING STEPS

1. Read resource #1 to learn the factors that determine the electrical characteristics of materials.
2. Read resource #2 to learn the meaning of the terms: conductors, insulators and semiconductors.
3. Complete resource #3 to ensure an understanding of the material.
4. Complete resource #4 on approval of your instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 28-31 in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 3-4 to 3-6, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 3-7, (see instructor for answer sheet).
4. MIO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	115	115	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY ELECTRICAL QUANTITIES

LEARNING STEPS

1. View resource #1 to learn about the coulomb, ampere, voltage and resistance.
2. Read resource #2 to reinforce the contents of resource #1.
3. Read resource #3 to learn how these units are used in electrical circuits.
4. Complete resource #4 to ensure an understanding of the material.
5. Complete resource #5 after approval of your instructor.

RESOURCES

1. Filmstrip/cassette: #E/E-100-036, "The Electron Theory" by Bergwall in LRC.
2. Electricity and Electronics by Gerrish and Dugger, pp. 12 to 14 in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 3-8 to 3-9 in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 3-9 in LRC. (see instructor for answer sheet).
5. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	115	115	003

MICRO - PERFORMANCE OBJECTIVE #4

EXPLAIN BASIC ELECTRICITY

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return this guide to resource #3.

RESOURCES

1. MPO #1-3, this guide.
2. Criterion exam: #E/E-100-115 from your instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	115	115	004



COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

CIVEC
301 N. Swift Road
Addison, Illinois 60101
312/620-8770

Produced By
A. J. Eggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

EXPLAIN ALTERNATE POWER SOURCES

Purpose

Alternating current entering your home is a form of electricity that you use on a daily basis, but there are also alternate power sources that you depend upon daily. In this guide you will study these forms of energy and their effects upon your daily life.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	130	16 hours	127

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN EXAMINATION, EXPLAIN ALTERNATE POWER SOURCES. TO MASTER THIS TASK, YOU MUST SCORE 16 OUT OF 20, 80%, ON A WRITTEN CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify cells and batteries.
2. Identify thermocouples and solar cells.
3. Explain alternate power sources.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	130	130

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY CELLS AND BATTERIES

LEARNING STEPS

1. Read resource #1 to gain a basic understanding of cells and batteries.
2. Read resource #2 to learn about cells and batteries as power sources.
3. Complete resource #3 to test your comprehension of the material.
4. Complete resource #4 on approval of your instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger. PP. 15 to 23, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 4-1 to 4-5, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 4-6 in LRC. (see your instructor for answer sheet).
4. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	130	130	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY THERMOCOUPLES AND SOLAR CELLS

LEARNING STEPS

1. Read resource #1 to gain an understanding of electrical energy from heat and light.
2. Read resource #2 to learn how thermocouples and solar cells produce electricity.
3. Complete resource #3 to measure voltage and current produced by these devices.
4. Complete resource #4 to test your understanding of the material.
5. Go to resource #5 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 23 to 26, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. p. 4-7 in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 4-8 to 4-9, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 4-9 in LRC. (see instructor for answer sheet).
5. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	130	130	002

MICRO - PERFORMANCE OBJECTIVE #3

EXPLAIN ALTERNATE POWER SOURCES

LEARNING STEPS

1. Complete resource #1 to test your understanding of this material.
2. Review resource #2 to prepare for criterion exam.
3. Complete resource #3 to test your comprehension of this task.
4. Return this guide to resource #4.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger. Questions p. 27 in LRC. (see instructor for answer sheet).
2. MPO #1, 2 and this guide.
3. Criterion exam: #E/E-100-130 from instructor.
4. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	130	130	003



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A LEARNING GUIDE

Task

INTERPRET OHM'S LAW AND POWER

Purpose

In order to understand the correct mathematical relationships of voltage, current and resistance of a circuit and enhance your ability to troubleshoot new circuits, Ohm's law must be mastered. This guide will enable you to make the correct mathematical calculations to determine the proper values of voltage, current and resistance.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	139	16 hours	130

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

16 hours

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, INTERPRET OHM'S LAW AND POWER. TO MASTER THIS TASK YOU MUST SCORE 16 OUT OF 20, OR 80%, ON THE WRITTEN CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify a complete circuit.
2. Interpret Ohm's law and power.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	139	139

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY A COMPLETE CIRCUIT

LEARNING STEPS

1. Read resource #1 to become familiar with simple schematic diagrams and identification of complete circuits.
2. Complete resource #2, connecting several circuits and observe various aspects of their operation.
3. Complete resource #3 to test your comprehension of the material.
4. Go to resource #4 on approval of your instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 5-1 to 5-2, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 5-2 to 5-4, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 5-4 to 5-5, in LRC (see instructor for the answer sheet).
4. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	139	139	001

MICRO - PERFORMANCE OBJECTIVE #2

INTERPRET OHM'S LAW AND POWER

LEARNING STEPS

1. Read resource #1 to learn the mathematical relationship of voltage, current and resistance.
2. View resource #2 to learn the procedure of taking measurements in a basic circuit.
3. View resource #3 to learn the interrelationships of voltage, current and resistance.
4. Complete resource #4 to measure the relationship of voltage, current and resistance.
5. Complete resource #5 to ensure your understanding of this material.
6. Review resource #6 to prepare for criterion exam.
7. Complete resource #7 to check your comprehension of this material.
8. Return this guide to resource #8.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 31 to 35, in LRC.
2. Filmstrip/cassette by Bergwall, #E/E-100-038 "Meter Reading and Ohm's Law, in LRC.
3. Videotape, "Ohm's Law and Power" by T.I., #E/E-100-009, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 5-6 to 5-7, in LRC.
5. Activity sheet: #100-139-002, this guide (see instructor for answer sheet).
6. MPO #1 and this MPO, this guide.
7. Criterion exam: #E/E-100-139 from instructor.
8. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	139	139	002

ACTIVITY SHEET

#139-002-001

1. Find the current.

E = VOLTS 75
P = OHMS 1500
I = _____ MA

2. Find the resistance.

E = 150 VOLTS
I = 12 MA
P = _____ OHMS

3. Find the voltage.

P = 2500 OHMS
I = 15 MA
E = _____ VOLTS

4. Find the voltage.

P = 450 OHMS
I = 50 MA
E = _____ VOLTS

5. Find the current.

P = 820 OHMS
E = 45 VOLTS
I = _____ MA

6. Find the current and the power.

E = 42.8 V
P = 16 K OHMS
I = _____ MA
P = _____ MW

7. Find the voltage and the power.

I = 18 MA
P = 33 K OHMS
E = _____ VOLTS
P = _____ WATTS

8. Find the voltage and the power.

I = 732 MA
P = 10 OHMS
E = _____ VOLTS
P = _____ WATTS

DEPT.	PROG	TASK	TPO	MPO
E/E	100	139	139	002

Page 1 of 2

-continued-

ACTIVITY SHEET

#139-002-001

-continued-

9. Find the current and the power.

E = 71.3 V
P = 482 K OHMS
I = _____ MICPO AMPS
P = _____ MW

10. Find the current and the power.

E = 1.83 K VOLTS
P = 84 M OHMS
I = _____ MICPO AMPS
P = _____ MW

11. Find the resistance and the power.

E = 782 V
I = 100 MA
P = _____ W
P = _____ K OHMS

12. Find the resistance and the power.

E = 14.14 V
I = 707 MA
P = _____ OHMS
P = _____ WATTS

DEPT.	PROG	TASK	TPC	MPO
E/E	100	139	139	002

Page 2 of 2

ANSWERS FOR ACTIVITY SHEET

#139-002-001

1. $I = 50 \text{ MA}$
2. $P = 12.5 \text{ K}$
3. $E = 37.5 \text{ V}$
4. $E = 22.5 \text{ V}$
5. $I = 4.9 \text{ MA}$
6. $I = 2.68 \text{ MA}$
 $P = 115 \text{ MW}$
7. $E = 594 \text{ V}$
 $P = 10.7 \text{ W}$
8. $E = 7.32 \text{ V}$
 $P = 5.36 \text{ W}$
9. $I = 148 \text{ UA}$
 $P = 10.5 \text{ MW}$
10. $I = 21.8 \text{ UA}$
 $P = 39.9 \text{ MW}$
11. $P = 78.2 \text{ W}$
 $P = 7.82 \text{ K}$
12. $P = 20$
 $P = 10 \text{ W}$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	139	139	002



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A LEARNING GUIDE

Task

DEMONSTRATE ELECTRICAL MEASUREMENTS

Purpose

In order to correctly measure the voltage and the current in a circuit, the electrician and electronics technician must properly insert the voltmeter and/or ammeter into the circuit. This guide will enable you to correctly install the various meters into the circuits to be measured.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	142	16 hours	139

6-82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

16

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) _____

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN THE ELECTRICITY CONCEPTS TRAINER, A SIMPSON 260-6P MULTIMETER AND THE LAB AREA, IDENTIFY THE DIFFERENCES BETWEEN AN AMMETER AND VOLTMETER. MEASURE DC VOLTAGE AND CURRENT IN A SERIES, PARALLEL AND COMPOUND CIRCUIT. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%, AND A SCORE OF 9 OUT OF 10, OR 90%, ON THE PERFORMANCE CHECKLIST.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify different meter circuits.
2. Measure voltage and current.
3. Demonstrate electrical measurements.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	142	142

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY DIFFERENT METER CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the basics of meters.
2. View resource #2 for a more indepth analysis of meter movements.
3. Read resource #3 to learn calculations for shunts and multipliers.
4. Complete resource #4 to calculate shunts and multipliers.
5. Complete resource #5 to determine comprehension of the material.
6. Complete resource #6 on instructor's approval.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 143 to 154, in LRC.
2. Film loops:
D/Arsonval moving coil, #E/E-100-450
Millimeter shunt actions, E/E-100-455
Ohmmeters, series/shunt, #E/E-100-465
Wattmeters action, #E/E-100-475
Ammeters/shunts, #E/E-100-037
Voltages/Multipliers, #E/E-100-038, by Animated Electronic Films, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 6-8 to 6-10, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 6-10 to 6-11, in LRC.
5. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 6-11 (see instructor for answer sheet).
6. MPO #2, this guide.

DEPT	PROC	TASK	TPO	MPO
E/E	100	142	142	001

MICRO - PERFORMANCE OBJECTIVE #2

MEASURE VOLTAGE AND CURRENT

LEARNING STEPS

1. Read resource #1 to learn the principles of measuring voltage and current.
2. Complete resource #2 to gain practical experience measuring voltage and current.
3. Complete resource #3 to test your understanding of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 7-1 to 7-3, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. pp. 7-3 to 7-5, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 7-6 to 7-7 (see instructor for answer sheet).
4. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	142	142	002

MICRO - PERFORMANCE OBJECTIVE #3

DEMONSTRATE ELECTRICAL MEASUREMENTS

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Complete resource #3 to demonstrate ability to perform electrical measurements, turn into your instructor for evaluation.
4. Your instructor will use resource #4A to evaluate your performance on resource #4B.

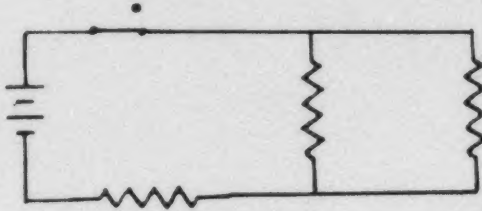
RESOURCES

1. MPO #1 and 2, this guide.
2. Criterion exam: #E/E-100-142 from instructor.
3. Activity sheet: #142-003-001.
4. A. Performance Product Checklist.
B. Activity sheet: #142-003-001.

DEPT	PROG	TASK	TPO	MPO
E/E	100	142	142	003

ACTIVITY SHEET
#142-003-001

1. Build the circuit below.



2. Measure current through IR 1 _____ MA.
3. Measure current through IR 2 _____ MA.
4. Measure current through IR 3 _____ MA.
5. Measure voltage drop ER 1 _____ V.
6. Measure voltage drop ER 2 _____ V.
7. Measure voltage drop ER 3 _____ V.
8. Compute power PR 1 _____ WATTS.
9. Compute power PR 2 _____ WATTS.
10. Compute power PR 3 _____ WATTS.
11. Compute total power of circuit PT _____ WATTS.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	142	142	003

PROGRAM: 100

TASK: 142

TASK # 142

PERFORMANCE/PRODUCT CHECKLIST

STUDENT'S NAME _____ EVALUATION SITE _____

EVALUATOR'S NAME _____ PERFORMANCE ATTEMPT 1 2 3 4

DATE OF ATTEMPT _____

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN THE ELECTRICITY CONCEPTS TRAINER, A SIMPSON 260-6P MULTIMETER, AND LAB AREA, MEASURE DC VOLTAGE AND CURRENT IN A SERIES, PARALLEL AND COMPOUND CIRCUIT.

DIRECTIONS TO THE STUDENT:

BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE BASIS OF THIS CHECKLIST. WHEN YOU FEEL YOU ARE READY FOR EVALUATION CONTACT YOUR INSTRUCTOR. YOU MUST COMPLETE YOUR PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE AT LEAST 90 OUT OF 100 POINTS OR 90 % FOR MASTERY. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED.

DIRECTIONS TO THE EVALUATOR:

THE STUDENT WILL CONTACT YOU WHEN READY FOR EVALUATION. THE STUDENT MUST COMPLETE THE PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE 90 OUT OF 100 POINTS OR 90 % AND ALL ITEMS MARKED WITH AN ASTERISK (*) MUST BE SATISFACTORILY COMPLETED.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	142	142	003

CRITICAL ITEMS	ITEMS TO BE OBSERVED OR CHECKED	RATING											
		YES	NO										
	BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE FOLLOWING ITEMS. WHEN YOU FEEL YOU ARE READY FOR EVALUATION, CONTACT YOUR INSTRUCTOR. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED. * 1. Circuit correctly constructed from schematic. * 2. Ammeter properly inserted in circuit to measure IR 1. 3. Ammeter properly inserted in circuit to measure IR 2 and IR 3. * 4. Voltmeter properly inserted in circuit to measure ER 1. 5. Voltmeter properly inserted in circuit to measure ER 2 and ER 3. 6. PR 1 correctly computed. 7. PR 2 and PR 3 correctly computed. * 8. PT correctly computed. * 9. Correct safety procedures followed. 10. All material returned to proper storage.												
		TOTAL POINTS EARNED =											
		POINTS NEEDED FOR MASTERY = 90 TOTAL POINTS POSSIBLE = 100											
<table border="1"> <thead> <tr> <th>DEPT.</th> <th>PROG</th> <th>TASK</th> <th>TPO</th> <th>MPO</th> </tr> </thead> <tbody> <tr> <td>E/E</td> <td>100</td> <td>142</td> <td>142</td> <td>003</td> </tr> </tbody> </table>				DEPT.	PROG	TASK	TPO	MPO	E/E	100	142	142	003
DEPT.	PROG	TASK	TPO	MPO									
E/E	100	142	142	003									



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A LEARNING GUIDE

Task

IDENTIFY/MEASURE RESISTORS AND RESISTANCE

Purpose

Almost all electrical and electronic circuits contain various types of resistors and it is imperative that you can interpret the color code and markings. This guide will enable you to make a quick identification of the ohmic value and tolerance of composition resistors.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	145	16 hours	142

5-89

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) _____

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERION EXAM, IDENTIFY/MEASURE RESISTORS AND RESISTANCE. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM, WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.
ON A PERFORMANCE CHECKLIST, SCORE 8 OUT OF 10, OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify resistor color code.
2. Identify variable resistors.
3. Identify/measure resistors and resistance.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
3/E	100	145	145

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY RESISTOR COLOR CODE

LEARNING STEPS

1. View resource #1 to learn resistance indicated by color code.
2. Read resource #2 to learn the definition of resistors.
3. View resource #3 to determine purpose of color coding and tolerance rating.
4. Read resource #4 to learn the details of the resistor color code.
5. Complete resource #5 to practice determining resistance values.
6. Complete resource #6 to check your comprehension of material.
7. Go to resource #7 on approval of instructor.

RESOURCES

1. Videotape: #E/E-100-006 "Interpreting the Resistor Color Code" by T.I., in LFC.
2. Electricity and Electronics by Gerrish and Dugger, pp. 36, 37, 306 and 307, in LFC.
3. Filmstrip/cassette: #E/E-100-041 "Resistor and Complex Circuits" by Bergwall, in LFC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 8-6 to 8-8, in LFC.
5. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures 8-8 to 8-9, in LFC.
6. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 8-9 (see instructor for answer sheet).
7. MIO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	145	145	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY VARIABLE RESISTORS

LEARNING STEPS

1. Read resource #1 to learn the difference between rheostats and potentiometers.
2. Complete resource #2 to learn use of these devices in controlling current and voltage.
3. Complete resource #3 to check your understanding of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 8-10 to 8-12, in LPC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 8-12 to 8-13, in LPC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 8-13 (see instructor for answer sheet).
4. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/R	100	145	145	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY/MEASURE RESISTORS AND RESISTANCE

LEARNING STEPS

1. Read resource #1 to learn how all components have resistance.
2. Complete resource #2, using the ohmmeter to measure resistance of various components.
3. Complete resource #3 to check your comprehension of the material.
4. Complete resource #4 to demonstrate ability to identify/measure resistors and resistance.
5. Review resource #5 to prepare for criterion exam.
6. Complete resource #6 to check your understanding of this
7. Return packet to resource #7.

RESOURCES

1. Electricity Concepts, Unit 1, by Energy Concepts, Inc., pp. 8-1 and 8-2, in LRC.
2. Electricity Concepts, Unit 1, by Energy Concepts, Inc. Procedures pp. 8-2 to 8-4, in LRC.
3. Electricity Concepts, Unit 1, by Energy Concepts, Inc. Questions p. 8-5 (see instructor for answer sheet).
4. Performance Checklist #145, this guide, (see instructor for materials).
5. MPO # 1,2 and above resources, this packet.
6. Criterion exam: #E/E 100-145 from instructor.
7. Instructor.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	145	145	003

PROGRAM: 100

TASK: IDENTIFY/MEASURE RESISTORS AND RESISTANCE

TASK # 145

PERFORMANCE/PRODUCT CHECKLIST

STUDENT'S NAME _____ EVALUATION SITE _____

EVALUATOR'S NAME _____ PERFORMANCE ATTEMPT 1 2 3 4

DATE OF ATTEMPT _____

TERMINAL PERFORMANCE OBJECTIVE:

IDENTIFY/MEASURE RESISTORS AND RESISTANCE.

DIRECTIONS TO THE STUDENT:

BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE BASIS OF THIS CHECKLIST. WHEN YOU FEEL YOU ARE READY FOR EVALUATION CONTACT YOUR INSTRUCTOR. YOU MUST COMPLETE YOUR PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE AT LEAST 80 OUT OF 100 POINTS OR 80 % FOR MASTERY. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED.

DIRECTIONS TO THE EVALUATOR:

THE STUDENT WILL CONTACT YOU WHEN READY FOR EVALUATION. THE STUDENT MUST COMPLETE THE PERFORMANCE WITHIN 120 MINUTES AND MUST SCORE 80 OUT OF 100 POINTS OR 80 % AND ALL ITEMS MARKED WITH AN ASTERISK (*) MUST BE SATISFACTORILY COMPLETED.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	145	145	003

CRITICAL ITEMS	ITEMS TO BE OBSERVED OR CHECKED	RATING											
		YES	NO										
	1. Read color code of resistor #1.												
	2. Read color code of resistor #2.												
	3. Read color code of resistor #3.												
	4. Read color code of resistor #4.												
	5. Read resistance of variable resistor #1 using an ohmmeter.												
	6. Read resistance of variable resistor #2 using an ohmmeter.												
	7. Read resistance of variable resistor #3 using an ohmmeter.												
	8. Read the total resistance of resistors connected in series by your instructor.												
	9. Read the total resistance of resistors connected in parallel by your instructor.												
	10. Read the total resistance of resistors connected in series/parallel by your instructor.												
		TOTAL POINTS EARNED =											
		POINTS NEEDED FOR MASTERY = 80											
		TOTAL POINTS POSSIBLE = 100											
		<table border="1"> <thead> <tr> <th>DEPT.</th><th>PROG</th><th>TASK</th><th>TPO</th><th>MPO</th></tr> </thead> <tbody> <tr> <td>E/E</td><td>100</td><td>145</td><td>145</td><td>003</td></tr> </tbody> </table>		DEPT.	PROG	TASK	TPO	MPO	E/E	100	145	145	003
DEPT.	PROG	TASK	TPO	MPO									
E/E	100	145	145	003									



COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

CIVEC
301 N. Swift Road
Addison, Illinois 60101
312/620-8770

Produced By
A.J. Eggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task SOLVE SERIES RESISTIVE CIRCUITS

Purpose In order to be able to understand the current requirements of a series circuit it is imperative that you be able to solve for total resistance in a series resistive circuit. This guide will enable you to identify and solve series resistive circuits.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	148	16 hours	145

6-82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERIAN EXAM, SOLVE FOR TOTAL RESISTANCE IN A SERIES CIRCUIT. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERIAN EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.

2a MICRO--PERFORMANCE OBJECTIVE(S)

1. Identify resistive series circuits.
2. Solve resistive series circuits.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	148	148

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY RESISTIVE SERIES CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the basics of a series circuit.
2. View resource #2 for an indepth explanation of series circuits.
3. View resource #3 to learn constructing of a series circuit.
4. Read resource #4 to learn how to calculate total resistance of a series circuit.
5. Complete resource #5 to evaluate a series circuit.
6. Complete resource #6 to test your comprehension of a series circuit.
7. Go to resource #7 on instructor's approval.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp.38-40 in LRC.
2. Video tape #E/E 100-011, "Series Circuits" by T.I. in LRC.
3. Video tape # E/E 100-012, " Ohm's law and series circuits" by T.I., in LRC.
4. Electricity Concepts, Unit I by Energy Concepts, Inc. pp.9-1 and 9-2, in LRC.
5. Electricity Concepts Unit I by Energy Concepts, Inc. Procedures pp.9-2 to 9-4, in LRC.
6. Electricity Concepts Unit I, by Energy Concepts, Inc. Questions p.9-4 (see instructor for answer sheet).
7. MPO #2 this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	148	148	001

MICRO - PERFORMANCE OBJECTIVE #2

SOLVE RESISTIVE SERIES CIRCUITS

LEARNING STEPS

1. Complete resource #1 to gain practice in solving more complex series circuits.
2. Review resource #2 to prepare for criterion exam.
3. Complete resource #3 to check your understanding of this task.
4. Return this guide to resource #4.

RESOURCES

1. Activity Sheet # E/E 148-002 this guide.
2. MPO #1 and above resource.
3. Criterion exam # E/E 100-148 from instructor.
4. Instructor.

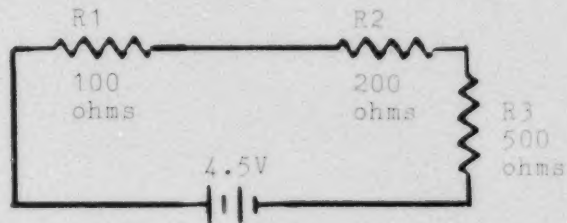
DEPT	PROG	TASK	TPO	MPO
E/E	100	148	148	002

ACTIVITY SHEET

E/E 148-002

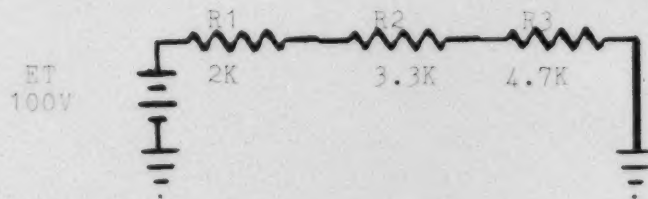
Given schematics of several resistors connected in series of the type shown, calculate the values required.

1. Find the following values for this circuit.



- a. $E_{r1} =$ _____
- b. $E_{r2} =$ _____
- c. $E_{r3} =$ _____
- d. $I_t =$ _____
- e. $R_t =$ _____

2. Find the following values for this circuit.



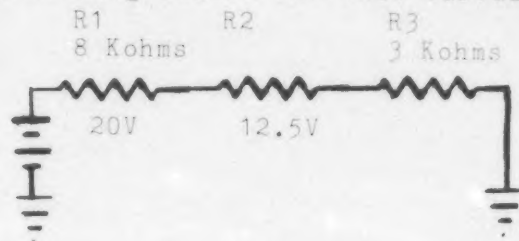
- a. $E_{r1} =$ _____
- b. $E_{r2} =$ _____
- c. $E_{r3} =$ _____
- d. $I_t =$ _____
- e. $R_t =$ _____
- f. $P_t =$ _____

DEPT.	PROG	TASK	TPO	MPO
E/E	100	148	148	002

ACTIVITY SHEET

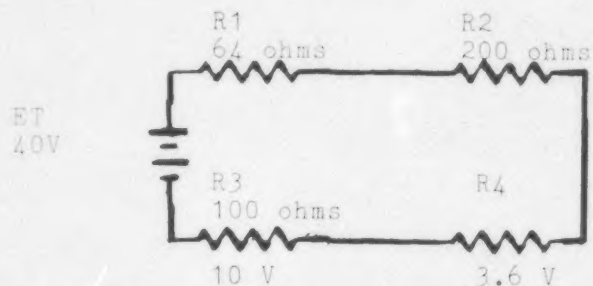
E/E 148-002

3. Find the following values for this circuit.



- a. $E_T =$ _____
- b. $R_T =$ _____
- c. $I_T =$ _____
- d. $R_2 =$ _____
- e. $E_{R_3} =$ _____
- f. $P_T =$ _____

4. Find the following values for this circuit.



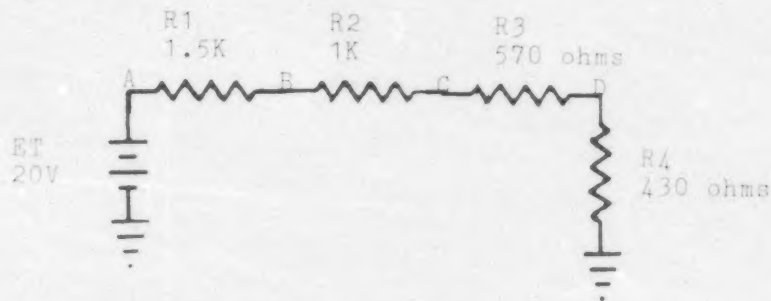
- a. $I_T =$ _____
- b. $R_T =$ _____
- c. $R_4 =$ _____
- d. $E_{R_1} =$ _____
- e. $E_{R_2} =$ _____
- f. $P_T =$ _____

DEPT.	PROG	TASK	TPO	MPO
E/E	100	148	148	002

ACTIVITY SHEET

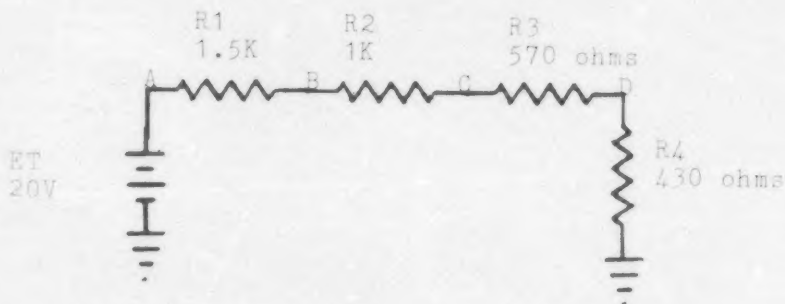
E/E 148-00²

5. Using "ground" as the reference point, what is the amount of voltage and polarity measured at point:



- a. = _____ V
 b. = _____ V
 c. = _____ V
 d. = _____ V

6. Using point "B" as a reference point, what is the amount of voltage and polarity measured at point:



- a. = _____ V
 b. = _____ V
 c. = _____ V
 d. = _____ V

DEPT.	PROG	TASK	TPO	MPO
E/E	100	148	148	002

ANSWERS FOR
ACTIVITY SHEET

E/E 148-002

1. a.=5.6V
b.=1.12V
c.=2.8V
d.=5.6ma
e.=800 ohms

2. a.= 20V
b.= 33V
c.= 47V
d.= 10ma
e.= 10K
f.= 1W

3. a.= 40V
b.= 16K
c.= 2.5ma
d.= 5K
e.= 7.5V
f.= .1W

4. a.= 100ma
b.= 400 ohms
c.= 36 ohms
d.= 6.4V
e.= 20V
f.= 4W

5. a.= +20V
b.= +11.43V
c.= +5.72V
d.= +2.47V

6. a.= +8.57V
b.= 0V
c.= -5.71V
d.= -8.03V

DEPT.	PROG	TASK	TPO	MPO
E/E	100	148	148	002



COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

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A LEARNING GUIDE

Task

SOLVE PARALLEL RESISTIVE CIRCUITS

Purpose

In order to be able to understand the current requirements of a parallel circuit it is imperative that you be able to solve for total resistance in a parallel resistive circuit. This guide will enable you to identify and solve parallel resistive circuits.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	151	16 hours	148

6-82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

16 hours

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERIAN EXAM, SOLVE PARALLEL RESISTIVE CIRCUITS. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERIAN EXAM WITH A MINIMUM SCORE OF 80%, OR 16 OUT OF 20 ON THE WRITTEN EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify parallel resistive circuits.
2. Identify equal resistances in parallel.
3. Solve parallel resistive circuits.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	151	151

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY PARALLEL RESISTIVE CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the basics of a parallel circuit.
2. View resource #2 for an indepth explanation of parallel circuits.
3. Read resource #3 to learn how to calculate resistance of resistors in parallel.
4. Complete resource #4 to evaluate parallel circuits.
5. Complete resource #5 to check your understanding of parallel circuits.
6. Go to resource #6 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp.40-42 in LRC.
2. Video tapes #E/E 100-013 "Introduction to Parallel Circuits" and E/E 100-014 "Parallel Resistances" by T.I., in LRC.
3. Electricity Concepts Unit I by Energy Concepts Inc., p. 9-5, in LRC.
4. Electricity Concepts Unit I by Energy Concepts Inc., Procedures pp.9-6 to 9-7, in LRC.
5. Electricity Concepts Unit I by Energy Concepts Inc., Questions pp. 9-7 and 9-8, in LRC.
6. MPO #2 this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	151	151	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY EQUAL VALUE RESISTANCES IN PARALLEL

LEARNING STEPS

1. View resource #1 to learn analysis of parallel circuits.
2. Read resource #2 to learn to calculate resistance of equal valued resistors in parallel.
3. Complete resource #3 to demonstrate your understanding of equal valued resistors in parallel.
4. Complete resource #4 to check your comprehension of the material.
5. Go to resource #5 on approval of instructor.

RESOURCES

1. Video tapes #E/E 100-015 "Parallel Circuit Analysis" and #E/E 100-016 "Parallel Circuits and their Analysis" by T.I., in LRC.
2. Electricity Concepts Unit I by Energy Concepts Inc., p.9-9, in LRC.
3. Electricity Concepts Unit I by Energy Concepts Inc., p.9-10, in LRC.
4. Electricity Concepts Unit I by Energy Concepts Inc., Questions pp. 9-10 and 9-11, (see instructor for answer sheet).
5. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	151	151	002

MICRO - PERFORMANCE OBJECTIVE #3

SOLVE PARALLEL RESISTIVE CIRCUITS

LEARNING STEPS

1. Complete resource #1 to gain practice in solving more complex parallel circuits.
2. Review resource #2 to prepare for criterion exam.
3. Complete resource #3 to check your understanding of this task.
4. Return this packet to resource #4.

RESOURCES

1. Activity Sheet #E/E 100-151-003 this guide.
2. MPO #1,2, and the material in this MPO.
3. Criterion exam #E/E 100-151 from instructor.
4. Instructor.

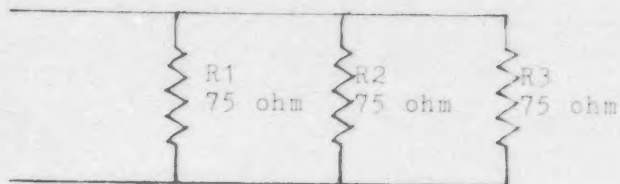
DEPT	PROG	TASK	TPO	MPO
E/E	100	151	151	003

ACTIVITY SHEET

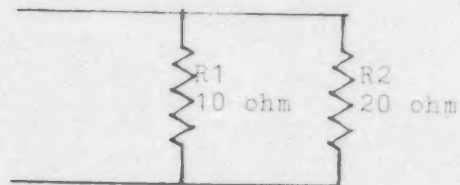
E/E 100-151-003

Given schematics of several resistors connected in parallel of the type shown, calculate the values required.

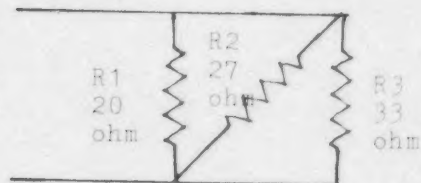
1. $R_T =$ _____ OHMS



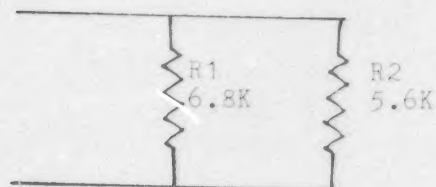
2. $R_T =$ _____ OHMS



3. $R_T =$ _____ OHMS



4. $R_T =$ _____ OHMS



5. $R_T =$ _____ OHMS

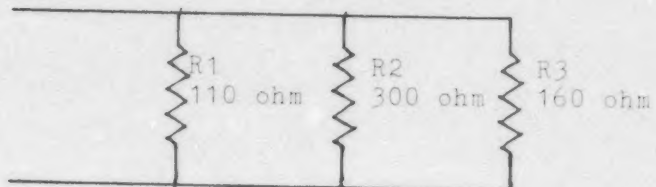


DEPT.	PROG	TASK	TPO	MPO
E/E	100	151	151	003

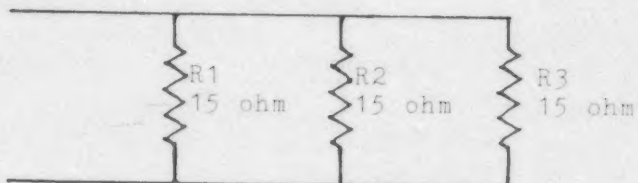
ACTIVITY SHEET

E/E 100-151-003
continued

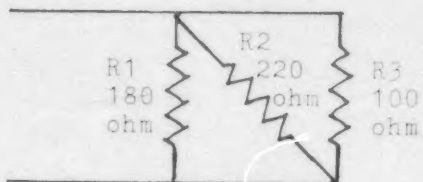
6. $R_T =$ _____ OHMS



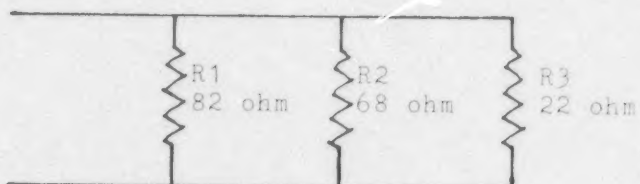
7. $R_T =$ _____ OHMS



8. $R_T =$ _____ OHMS



9. $R_T =$ _____ OHMS



10. $R_T =$ _____ OHMS



DEPT.	PROG	TASK	TPO	MPO
E/E	100	151	151	003

ANSWER SHEET
FOR
ACTIVITY SHEET
E/E 100-151-003

1. RT= 25 ohms
2. RT= 6.67 ohms
3. RT= 8.52 ohms
4. RT= 3.07Kohms
5. RT= 15 ohms
6. RT= 53.5 ohms
7. RT= 5 ohms
8. RT= 49.7 ohms
9. RT= 13.8 ohms
10. RT= 8 ohms

DEPT.	PROG	TASK	TPO	MPO
E/E	100	151	151	003



COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

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301 N. Swift Road
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Produced By
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Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

COMPUTE THEVENIN'S AND NORTON'S THEOREMS

Purpose

Thevenin's and Norton's theorems are methods of solution for circuits that cannot be solved by Ohm's law and the general rules for series and parallel circuits. This guide will enable you to identify such circuits and provide you with the knowledge of simplifying these circuits.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	157	16 hours	154

6-82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERION EXAM, IDENTIFY THEVENIN'S THEOREM AND NORTON'S THEOREM. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify Thevenin's Theorem.
2. Identify Norton's Theorem.
3. Compute Thevenin's and Norton's Theorems.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	157	157

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY THEVENIN'S THEOREM

LEARNING STEPS

1. Read resource #1 to learn about Thevenin's Theorem as a means of simplifying complex circuits.
2. Complete resource #2 using this method of circuit analysis.
3. Complete resource #3 to evaluate your comprehension of the material.
4. Go to resource #4 on instructor's approval.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 10-1 to 10-5, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 10-5 to 10-6, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 10-6 (see instructor for answer sheet).
4. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	157	157	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY NORTON'S THEOREM

LEARNING STEPS

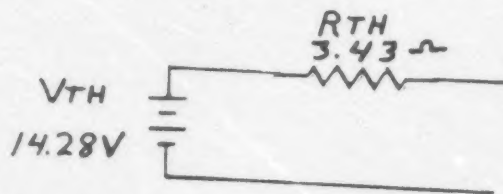
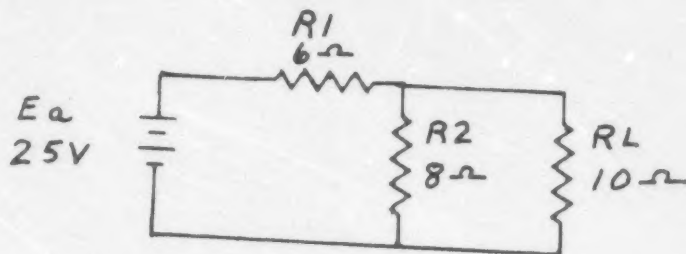
1. Read resource #1 to learn about Norton's Theorem as a means of simplifying complex circuits.
2. Study resource #2 for a comparison of Thevenin and Norton's Theorems.
3. Complete resource #3 using Norton's Theorem of circuit analysis.
4. Complete resource #4 to test your understanding of the material.
5. Go to resource #5 on instructor's approval.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 10-7 to 10-9, in LRC.
2. Information sheets: #E/E-157-002-001 thru E/E-157-002-006, this guide.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures p. 10-10, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 10-11 (see instructor for answer sheet).
5. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	157	157	002

THEVENIN'S THEOREM
INFORMATION SHEET
#E/E 157-002-001



$$E_{R2} = \frac{E_a \times R_2}{R_1 + R_2} = \frac{25 \times 8}{6 + 8} = 14.28V$$

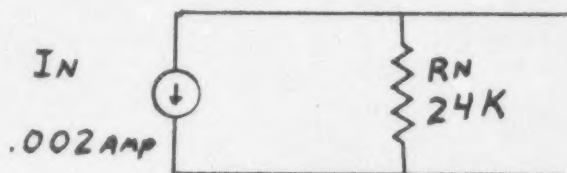
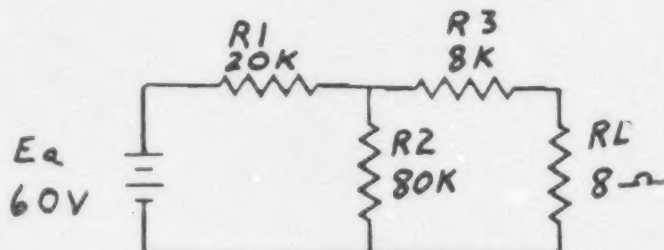
$$V_{TH} = E_{R2}$$

$$R_{TH} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{6 \times 8}{6 + 8} = 3.43\Omega$$

$$I_L = \frac{V_{TH}}{R_{TH} + R_L} = \frac{14.28}{3.43 + 10} = 1.06 \text{ AMPS}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

NORTON'S THEOREM
 INFORMATION SHEET
 #E/E 157-002-002



$$R_{23} = \frac{R_2 \times R_3}{R_2 + R_3} = \frac{80K \times 8K}{80K + 8K} = 7.27K \Omega$$

$$R_T = R_1 + R_{23} = 20K + 7.27K = 27.27K \Omega$$

$$I_T = \frac{E_a}{R_T} = \frac{60}{27.27K} = .002 \text{ AMPS}$$

$$I_{R3} = \frac{I_T \times R_2}{R_2 + R_3} = \frac{.002 \times 80K}{80K + 8K} = .002 \text{ AMPS}$$

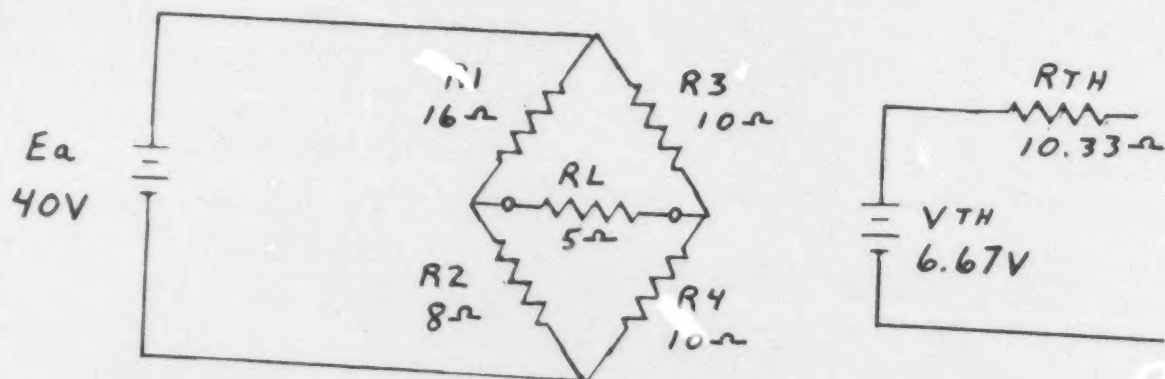
$$I_N = I_{R3}$$

$$R_N = \frac{R_1 \times R_2}{R_1 + R_2} + R_3 = \frac{20K \times 80K}{20K + 80K} + 8K = 24K \Omega$$

$$I_L = \frac{I_N \times R_N}{R_N + R_L} = \frac{.002 \times 24K}{24K + 8 \Omega} = .00199 \text{ AMPS}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

THEVENIN'S THEOREM
INFORMATION SHEET
#E/E 157-002-003



$$E_{R2} = \frac{E_a \times R_2}{R_1 + R_2} = \frac{40 \times 8}{16 + 8} = 13.33V$$

$$E_{R4} = \frac{E_a \times R_4}{R_3 + R_4} = \frac{40 \times 10}{10 + 10} = 20V$$

$$V_{TH} = E_{R4} - E_{R2} \\ = 20 - 13.33 = 6.67V$$

$$R_{T1} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{16 \times 8}{16 + 8} = 5.33\Omega$$

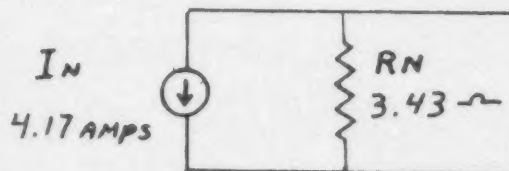
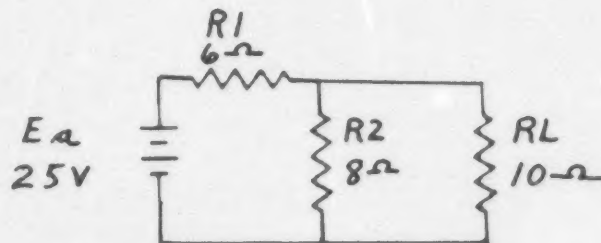
$$R_{T2} = \frac{R_3 \times R_4}{R_3 + R_4} = \frac{10 \times 10}{10 + 10} = 5\Omega$$

$$R_{TH} = R_{T1} + R_{T2} = 5.33 + 5 = 10.33\Omega$$

$$I_L = \frac{V_{TH}}{R_{TH} + R_L} = \frac{6.67}{10.33 + 5} = .435 \text{ AMPS}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

NORTON'S THEOREM
 INFORMATION SHEET
 #E/E 157-002-004



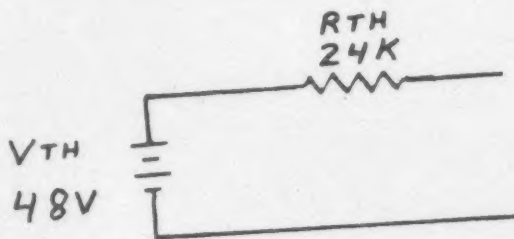
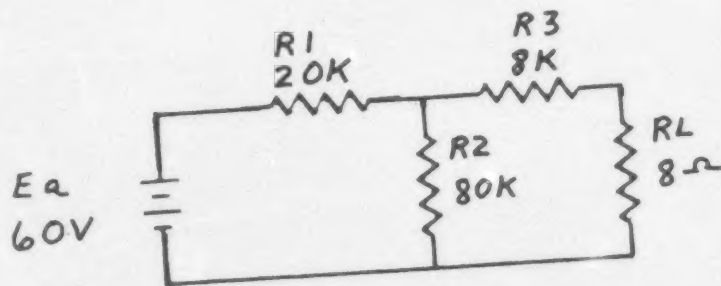
$$I_N = \frac{E_a}{R_1} = \frac{25}{6} = 4.17 \text{ AMPS}$$

$$R_N = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{6 \times 8}{6 + 8} = 3.43 \Omega$$

$$I_L = \frac{I_N \times R_N}{R_N + R_L} = \frac{4.17 \times 3.43}{3.43 + 10} = 1.06 \text{ AMPS}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

THEVENIN'S THEOREM
INFORMATION SHEET
#E/E 157-002-005



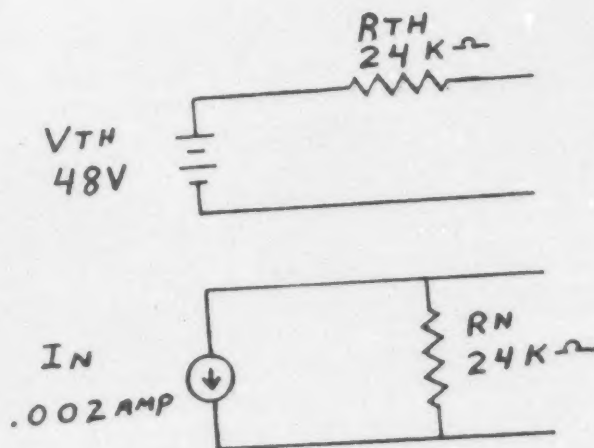
$$V_{TH} = \frac{E_a \times R_2}{R_1 + R_2} = \frac{60 \times 80K}{20K + 80K} = 48V$$

$$R_{TH} = \frac{R_1 \times R_2}{R_1 + R_2} + R_3 = \frac{20K \times 80K}{20K + 80K} + 8K = 24K\Omega$$

$$I_L = \frac{V_{TH}}{R_{TH} + R_L} = \frac{48}{24K + 8} = .00199 \text{ AMPS}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

CONVERSION FORMULAS
 INFORMATION SHEET
 #E/E 157-002-006



$$R_N = R_{TH}$$

$$I_N = \frac{V_{TH}}{R_{TH}} = \frac{48}{24\text{ K}} = .002\text{ AMP}$$

$$V_{TH} = I_N \times R_N = .002 \times 24\text{ K} = 48\text{ V}$$

DEPT.	PROG	TASK	TPO	MPO
E/E	100	157	157	002

MICRO - PERFORMANCE OBJECTIVE #3

COMPUTE THEVENIN'S AND NORTON'S THEOREMS

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1 and 2, this guide.
2. Criterion exam: #E/E-100-157.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	157	157	003



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VOTEC
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A LEARNING GUIDE

Task EXPLAIN MAGNETISM

Purpose Magnetism and its effects are used extensively in electrical and electronic devices. Some of these are motors, generators, electromagnets, transformers, microphones, speakers, tape recorders, and phonograph pickups. This guide will enable you to understand magnetism and its effects on your daily life.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	160	16 hours	157

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

16 hours

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) _____

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERION EXAM, EXPLAIN MAGNETISM. MASTERY OF THIS TASK WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify magnetic poles and fields.
2. Identify temporary and permanent magnets.
3. Define magnetic permeability.
4. Explain magnetism.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	160	160

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY MAGNETIC POLES AND FIELDS

LEARNING STEPS

1. Read resource #1 to learn the basics of magnetism.
2. View resource #2 to learn the laws of magnetism and principles of operation.
3. Read resource #3 to learn about poles, fields and other magnetic effects.
4. Complete resource #4 to observe the effects of using magnetic devices.
5. Complete resource #5 to test your comprehension of the material.
6. Go to resource #6 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 49-53, in LPC.
2. Filmstrip/cassette: #E/E-200-037 "Magnetism and Electromagnetism", in LPC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 12-1 to 12-3, in LPC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures p. 12-4, in LPC.
5. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 12-5 (see instructor for answer sheet).
6. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	160	160	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY TEMPORARY AND PERMANENT MAGNETS

LEARNING STEPS

1. Read resource #1 to learn the difference between temporary and permanent magnets.
2. Complete resource #2 to observe the effects using magnetic devices.
3. Complete resource #3 to test your comprehension of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 12-6 to 12-8, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 12-8 and 12-9, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 12-10 (see instructor for answer sheet).
4. MFO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	160	160	002

MICRO -- PERFORMANCE OBJECTIVE #3

DEFINE MAGNETIC PERMEABILITY

LEARNING STEPS

1. Read resource #1 to learn what is meant by magnetic permeability.
2. Complete resource #2 to demonstrate some of these effects through magnetism and demagnetism of materials.
3. Complete resource #3 to evaluate your comprehension of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 12-11 to 12-12, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 12-12 and 12-13, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 12-3 (see instructor for answer sheet).
4. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	160	160	003

MICRO - PERFORMANCE OBJECTIVE #4

EXPLAIN MAGNETISM

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this material.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-3, this guide.
2. Criterion exam #E/E-100-160 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	160	160	004



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VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

DEFINE ELECTROMAGNETISM

Purpose

Electricity can produce a magnetic field and a magnetic field can produce electricity. This is the principle that causes motors and generators to operate. This guide will enable you to define these principles and apply them in your troubleshooting of equipment.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	163	8 hours	160

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

8 hours

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) _____

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERION EXAM, DEFINE ELECTROMAGNETISM. MASTERY OF THIS TASK WILL BE DEMONSTRATED BY PASSING A WRITTEN EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify magnetic fields and current.
2. Identify the solenoid.
3. Determine electromagnetic induction.
4. Determine electromagnetic induction with current.
5. Define electromagnetism.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	163	163

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY MAGNETIC FIELDS AND CURRENT

LEARNING STEPS

1. Read resource #1 to learn the principles and common uses of electromagnetism.
2. View resource #2 to learn how current/voltage is induced from one wire to another.
3. Read resource #3 to learn about fields and current with respect to electromagnetism.
4. Complete resource #4 to observe the effects of fields and current in wires and coils.
5. Complete resource #5 to evaluate your comprehension of the material.
6. Go to resource #6 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 53-55, in LRC.
2. Filmloop: E/E-100-420 "Induction Principles", in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 13-1 to 13-3, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures p. 13-4, in LRC.
5. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 13-5 (see instructor for answer sheet).
6. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	163	163	001

MICRO -- PERFORMANCE OBJECTIVE #2

IDENTIFY THE SOLENOID

LEARNING STEPS

1. Read resource #1 to learn about solenoids and electromagnets.
2. Complete resource #2 using a relay to control a lighting circuit.
3. Complete resource #3 to check your comprehension of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 13-6 and 13-7, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 13-7 and 13-8, in LPC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 13-8 (see instructor for answer sheet).
4. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	163	163	002

MICRO - PERFORMANCE OBJECTIVE #3

DETERMINE ELECTROMAGNETIC INDUCTION

LEARNING STEPS

1. Read resource #1 to learn about electromagnetic induction.
2. Complete resource #2 to demonstrate these principles using wires and coils in magnetic fields.
3. Complete resource #3 to check your understanding of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 13-9 to 13-11, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 13-11 to 13-13, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 13-13 (see instructor for answer sheet).
4. MFO #4, this guide.

DEPT	PROG	TASK	TPO	MFO
E/E	100	163	163	003

MICRO - PERFORMANCE OBJECTIVE #4

DETERMINE ELECTROMAGNETIC INDUCTION WITH CURRENT

LEARNING STEPS

1. Read resource #1 to learn about the magnetic effects produced by current in a wire or a coil.
2. Complete resource #2 to demonstrate motor action using this principle.
3. Complete resource #3 to check your understanding of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 13-14 and 13-15, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures p. 13-16, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions pp. 13-16 and 13-17 (see instructor for answer sheet)
4. MPO #5, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	163	163	004

MICRO - PERFORMANCE OBJECTIVE #5

DEFINE ELECTROMAGNETISM

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1, 2, 3 and 4, this SLG.
2. Criterion exam: #E/E-100-163 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	163	163	005



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Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task

IDENTIFY APPLICATIONS OF ELECTROMAGNETISM

Purpose

The interaction of magnetic fields is the basis for the operation of electric bells, buzzers, relays, and many other electronic and electrical devices. This guide will enable you to identify these devices and gain practical experience building circuits containing these electromagnetic devices.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	166	8 hours	163

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

8 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN CRITERION EXAM, IDENTIFY APPLICATIONS OF ELECTROMAGNETISM. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 16 OUT OF 20, OR 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify the operation of an electric bell and buzzer.
2. Identify the operation of a relay.
3. Identify applications of electromagnetism.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	166	166

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY THE OPERATION OF AN ELECTRIC BELL AND BUZZER

LEARNING STEPS

1. Read resource #1 to learn the basic operating principles of electromagnetic devices.
2. Read resource #2 to learn the operating principles of electric bells and buzzers.
3. Complete resource #3, constructing a buzzer to observe its operation.
4. Complete resource #4 to evaluate your comprehension of the material.
5. Go to resource #5 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 54 to 59, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 14-1 to 14-3, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc., Procedures p. 14-3, in LRC.
4. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions p. 14-4 (see instructor for answer sheet).
5. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	166	166	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY THE OPERATION OF A RELAY

LEARNING STEPS

1. Read resource #1 to learn the operating principles of relays.
2. Complete resource #2 using a relay as a means of controlling circuit operation.
3. Complete resource #3 to test your understanding of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit I, by Energy Concepts, Inc., pp. 14-5 to 14-8, in LRC.
2. Electricity Concepts, Unit I, by Energy Concepts, Inc. Procedures pp. 14-8 and 14-9, in LRC.
3. Electricity Concepts, Unit I, by Energy Concepts, Inc. Questions pp. 14-9 and 14-10, (see instructor for answer sheet)
4. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	166	166	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY APPLICATIONS OF ELECTROMAGNETISM

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MIO #1 and 2, this guide.
2. Criterion exam: #E/E-100-166 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	166	166	003



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A LEARNING GUIDE

Task OPERATE AUDIO SIGNAL GENERATORS

Purpose The audio signal generator produces a signal of known frequency and amplitude. This guide will enable you to properly operate the audio signal generator for servicing of the audio sections of radios, T.V.'s and stereo systems.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	169	16 hours	NONE

1-82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

SOCIAL SECURITY NUMBER _____

16

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN TWO AUDIO FREQUENCY GENERATORS AND THE LAB AREA, INTERPRET THE OPERATION OF THE MODEL E-310B SINE/SQUARE WAVE GENERATOR AND THE MODEL 3010 FUNCTION GENERATOR. MASTERY WILL BE DEMONSTRATED BY A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 85% AND A SCORE OF 100% ON THE PERFORMANCE CHECKLIST TO BE COMPLETED IN 60 MINUTES OR LESS.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Interpret the operation of the Model E-310B Sine/Square Wave Generator.
2. Interpret the operation of the Model 3010 Function Generator.
3. Operate audio signal generators.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	169	169

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

INTERPRET THE OPERATION OF THE MODEL E-310B SINE/SQUARE
WAVE GENERATOR

LEARNING STEPS

1. Read resource #1 to learn the operating controls of the audio signal generator.
2. View resource #2 to learn the operation of the sine/square wave generator.
3. Complete resource #3 to further familiarize yourself with the operation of the audio signal generator.
4. Proceed to resource #4.

RESOURCES

1. Model E-310B Instruction Manual by Dynascan Corporation, pp. 4 to 8, in LRC.
2. Video tape: #E/E-100-036 "B&K Model E-310B Sine/Square Wave Generator" by instructor, in LRC.
3. Model E-310B Instruction Manual by Dynascan Corporation, "Evaluation of Speakers" p. 12, in LRC.
4. MPO #2, this guide.

DEPT	PROC	TASK	TPO	MPO
E/E	100	169	169	001

MICRO - PERFORMANCE OBJECTIVE #2

INTERPRET THE OPERATION OF THE MODEL 3010 FUNCTION GENERATOR

LEARNING STEPS

1. Read resource #1 to learn the operating controls of a function generator.
2. View resource #2 to learn the operation of the function generator.
3. Complete resource #3 to further familiarize yourself with the operation of the function generator.
4. Go to resource #4.

RESOURCES

1. Model 3010 Instruction Manual by Dynascan Corporation, pp. 3-12, in LRC.
2. Video tape: #E/E-100-036 "B&K Model 3010 Function Generator" by instructor, in LRC.
3. Model 3010 Instruction Manual by Dynascan Corporation "Speaker Systems Testing", p. 18, in LRC.
4. MPO #3, this guide.

DEPT	PROC	TASK	TPO	MPO
E/E	100	169	169	002

MICRO - PERFORMANCE OBJECTIVE #3

OPERATE AUDIO SIGNAL GENERATORS

LEARNING STEPS

1. Review resource #1 to prepare for the criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Complete resource #3 for performance evaluation when you feel you can perform this task without resources or assistance.
4. Return this packet to resource #4.

RESOURCES

1. MPO #1 and 2, this guide.
2. Criterion exam: #E/E-100-169 from instructor.
3. Performance checklist: #E/E-100-169, this guide.
4. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	169	169	003

PROGRAM: 100

TASK: OPERATE AUDIO SIGNAL GENERATORS

TASK # 169

PERFORMANCE/PRODUCT CHECKLIST

STUDENT'S NAME _____ EVALUATION SITE _____

EVALUATOR'S NAME _____ PERFORMANCE ATTEMPT 1 2 3 4

DATE OF ATTEMPT _____

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN TWO AUDIO FREQUENCY GENERATORS AND THE LAB AREA, INTERPRET THE OPERATION OF THE MODEL E-310B SINE/SQUARE WAVE GENERATOR AND THE MODEL 3010 FUNCTION GENERATOR.

DIRECTIONS TO THE STUDENT:

BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE BASIS OF THIS CHECKLIST. WHEN YOU FEEL YOU ARE READY FOR EVALUATION CONTACT YOUR INSTRUCTOR. YOU MUST COMPLETE YOUR PERFORMANCE WITHIN 60 MINUTES AND MUST SCORE AT LEAST 10 OUT OF 10 POINTS OR 100 % FOR MASTERY. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED.

DIRECTIONS TO THE EVALUATOR:

THE STUDENT WILL CONTACT YOU WHEN READY FOR EVALUATION. THE STUDENT MUST COMPLETE THE PERFORMANCE WITHIN 60 MINUTES AND MUST SCORE 10 OUT OF 10 POINTS OR 100 % AND ALL ITEMS MARKED WITH AN ASTERISK (*) MUST BE SATISFACTORILY COMPLETED.

DEPT.	PROG	TASK	TPO	MPO
E/E	100	169	169	003

CRITICAL ITEMS	ITEMS TO BE OBSERVED OR CHECKED	RATING											
		YES	NO										
	BEFORE ATTEMPTING THIS TASK FOR MASTERY, CAREFULLY REVIEW THIS CHECKLIST. YOU WILL BE EVALUATED ON THE FOLLOWING ITEMS. WHEN YOU FEEL YOU ARE READY FOR EVALUATION, CONTACT YOUR INSTRUCTOR. CRITICAL ITEMS ARE MARKED WITH AN ASTERISK (*). THESE ITEMS MUST BE SATISFACTORILY COMPLETED. * 1. Observe proper safety precautions. * 2. Set Model E-310B for 60 HZ sine wave output at 5 volts RMS into oscilloscope. * 3. Set Model E-310B for 1 KHZ square wave output at 3 volts P-P on oscilloscope trace. * 4. Set Model E-310B for 7 KHZ sine wave output at 3 volts RMS into oscilloscope. * 5. Set Model E-310B for 140 KHZ sine wave output at 4 volts RMS into oscilloscope with 20 db attenuation. * 6. Set Model 3010 for 5 HZ sine wave output at 5 volts P-P into oscilloscope. * 7. Set Model 3010 for 60 HZ triangle wave at 3 volts P-P into oscilloscope. * 8. Set Model 3010 for 200 HZ square wave at 3 volts P-P with -5 volts DC offset into oscilloscope. * 9. Set Model 3010 for 5 KHZ sine wave at 4 volts P-P with +5 volts DC offset into oscilloscope. * 10. Set Model 3010 for 60 HZ TTL square wave into oscilloscope.												
TOTAL POINTS EARNED =													
POINTS NEEDED FOR MASTERY = 10 TOTAL POINTS POSSIBLE = 10													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DEPT.</th> <th>PROG</th> <th>TASK</th> <th>TPO</th> <th>MPO</th> </tr> </thead> <tbody> <tr> <td>E/E</td> <td>100</td> <td>169</td> <td>169</td> <td>003</td> </tr> </tbody> </table>				DEPT.	PROG	TASK	TPO	MPO	E/E	100	169	169	003
DEPT.	PROG	TASK	TPO	MPO									
E/E	100	169	169	003									

CRITERION EXAM

#E/E-100-169

DIPECTIONS: PLEASE DO NOT WRITE IN THIS PACKAGE: Using your own paper give a brief answer or indicate the letter most correct to each of the following questions. Turn in this exam and your answer sheet with your name, date and exam number to your instructor. To master this task you must score 17 out of 20 or 85%.

1. The output of the 3010 Function Generator can be programmed for _____.
 A) square wave
 B) sine wave
 C) triangle wave
 D) all the above
2. The maximum output frequency of the 3010 Function Generator is _____.
 A) 10 KHZ
 B) 100 KHZ
 C) 1 MEG.HZ
 D) none of the above
3. The output level of the TTL output is controlled by the amplitude control.
 A) True
 B) False
4. The maximum sine wave output frequency of the E-310B Sine/Square Wave Generator is _____.
 A) 2 KHZ
 B) 20 KHZ
 C) 200 KHZ
 D) 2 MEG.HZ
5. The maximum square wave output frequency of the E-310B Sine/Square Wave Generator is _____.
 A) 2 KHZ
 B) 20 KHZ
 C) 200 KHZ
 D) 2 MEG.HZ
6. The maximum output level (sine wave) of the E-310B into 600 ohms is _____.
 A) 0-5 V RMS
 B) 0-6 V RMS
 C) 0-7 V RMS
 D) 0-10 V RMS
7. The maximum output level (square wave) of the E-310B is _____.
 A) 0-5 V PEAK
 B) 0-6 V PEAK
 C) 0-7 V PEAK
 D) 0-10 V PEAK TO PEAK

DEPT.	PROG	TASK	TPO	MPO
E/E	100	169	169	003

Page 1 of 3

-continued-

CRITERION EXAM #E/E-100-169

(continued)

8. The step attenuator of the E-310B provides up to _____ db of attenuation.
 A) 36 db C) 56 db
 B) 46 db D) 66 db
9. If the range switch is set on x100 and the frequency dial is on 6, what is the output frequency of the E-310B?
 A) 6 HZ C) 600 HZ
 B) 60 HZ D) 6 KHZ
10. If the range selector of the 3010 is set on 10K and the frequency dial is on 7, what is the output frequency?
 A) 7 KHZ C) .7 KHZ
 B) 70 KHZ D) .07 KHZ
11. The DC offset control of the 3010 adds ± 5 V DC component to the signal appearing at 600 OHMS output jack.
 A) True B) False
12. What type of waves/waves is/are available at the output of the TTL jack on the 3010?
 A) sine wave C) triangle wave
 B) square wave D) all of the above
13. The TTL output of the 3010 is independent of the amplitude and DC offset controls.
 A) True B) False
14. If the range selector of the 3010 is set on 100K and the frequency dial is on 10, what is the output frequency?
 A) 10 KHZ C) 1 MEG. HZ
 B) 100 KHZ D) none of the above
15. An external voltage applied to the VCO Input of the 3010 can be used to vary the output frequency.
 A) True B) False
16. What value resistor must be connected in series with the speaker voice coil when using the E-310B for speaker evaluation.
 A) 10 OHM C) 60 OHM
 B) 100 OHM D) 600 OHM

DEPT.	PROG	TASK	TPO	MPO
E/E	100	169	169	003

Page 2 of 3

-continued-

CRITERION EXAM #E/E-100-169

-continued-

17. What value resistor must be connected in series with the speaker voice coil when using the 3010 for speaker evaluation.
A) 10 OHM
B) 100 OHM
C) 600 OHM
D) none required
18. The DC Offset feature can be used to convert the Model 3010 to a bipolar DC power supply.
A) True
B) False
19. The TTL pulse of the 3010 can supply a negative voltage.
A) True
B) False
20. What value resistor is used to terminate the cable of the 3010 to minimize ringing when using the higher output frequencies, the square wave and TTL outputs?
A) 10 OHMS
B) 100 OHMS
C) 60 OHMS
D) 600 OHMS

DEPT.	PROG	TASK	TPO	MPO
E/E	100	169	169	003

Page 2 of 2

CRITERION EXAM #E/E-100-169
ANSWER SHEET

1. D
2. C
3. B
4. D
5. C
6. B
7. D
8. C
9. C
10. B
11. A
12. B
13. A
14. C
15. A
16. B
17. D
18. A
19. B
20. D

DEPT.	PROG	TASK	TPO	MPO
E/E	100	169	169	003



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Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task ANALYZE INDUCTANCE

Purpose Inductive reactance opposes an alternating current, therefore, the electrician and electronics technician must comprehend this material in order to understand the functioning of relays and frequency determining networks. This guide will enable you to identify inductance and its effect in a circuit.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	209	16 hours	206

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME _____

16 hours

SOCIAL SECURITY NUMBER _____

LENGTH OF CONTRACT (NORMAL TIME IN HOURS) _____

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, ANALYZE INDUCTANCE. TO MASTER THIS TASK YOU MUST SCORE 16 OUT OF 20, OR 80%, ON THE CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify self-inductance in a coil.
2. Interpret inductance and AC.
3. Identify inductive circuits.
4. Interpret circuit applications of inductance.
5. Analyze inductance.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	209	209

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY SELF-INDUCTION IN A COIL

LEARNING STEPS

1. Read resource #1 to learn the basic characteristics of inductance.
2. View resource #2 for an introduction to L/R time constants.
3. Read resource #3 to learn the basic properties of inductance.
4. Complete resource #4 to investigate the factors that determine current in inductive circuits.
5. Complete resource #5 to test your knowledge of this material.
6. Go to resource #6 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 78-82 and 87-94, in LRC.
2. Video tape: #E/E-100-029 "Inductors and the L/R Time Constants" and E/E-100-030 "L/R Time Constants" by T.I., in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 16-1 to 16-3, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures p. 16-4, in LRC.
5. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 16-5 (see instructor for answer sheet).
6. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	209	209	001

MICRO - PERFORMANCE OBJECTIVE #2

INTERPRET INDUCTANCE AND AC

LEARNING STEPS

1. View resource #1 to learn the characteristics of inductors in AC circuits.
2. Read resource #2 to learn the meanings of reactance, impedance and phase angle.
3. Complete resource #3, using the knowledge in determining the characteristics of PL circuits.
4. Complete resource #4 to test your comprehension of this material.
5. Proceed to resource #5 on approval of instructor.

RESOURCES

1. Filmstrip/cassette: #E/E-200-038 "Inductors and Inductive Reactance" by Bergwall, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 16-6 to 16-9, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 16-9 and 16-10, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 16-10 (see instructor for answer sheet).
5. M10 #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	209	209	002

MICRO - PERFORMANCE OBJECTIVE #3

IDENTIFY INDUCTIVE CIRCUITS

LEARNING STEPS

1. View resource #1 to gain an understanding of RL circuit analysis.
2. Read resource #2 to learn the relationships between voltage, current and impedance in RL circuits.
3. Complete resource #3 to verify these relationships with measurements in series and parallel RL circuits.
4. Complete resource #4 to test your comprehension of this material.
5. Go to resource #5 on approval of instructor.

RESOURCES

1. Video tape: #E/E-200-019 "RL Circuit Analysis" by T.I., in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 16-11 to 16-13, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 16-13 to 16-15, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 16-16 (see instructor for answer sheet).
5. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	209	209	003

MICRO - PERFORMANCE OBJECTIVE #4

INTERPRET CIRCUIT APPLICATIONS OF INDUCTANCE

LEARNING STEPS

1. View resource #1 to determine RL time constants.
2. Read resource #2 to learn the two basic uses of inductors.
3. Complete resource #3 to observe these uses in practical electrical circuits.
4. Complete resource #4 to test your knowledge of this material.
5. Proceed to resource #5 on approval of instructor.

RESOURCES

1. Video tape: #E/E-200-024 "RL Time Constants" by T.I., in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 16-17 to 16-18, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 16-18 to 16-20, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 16-20 (see instructor for answer sheet).
5. MPO #5, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	209	209	004

MICRO - PERFORMANCE OBJECTIVE #5

ANALYZE INDUCTANCE

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-4, this guide.
2. Criterion exam: #E/E-100-209 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	209	209	005



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A LEARNING GUIDE

Task INTERPRET CAPACITIVE CIRCUITS

Purpose Capacitors react differently to DC and AC voltages and currents. This guide will enable you to understand these differences and apply this knowledge in circuit analysis and troubleshooting.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	215	16 hours	212

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, INTERPRET CAPACITIVE CIRCUITS. TO MASTER THIS TASK YOU MUST SCORE 16 OUT OF 20, OR 80%, ON THE CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify capacitance and frequency.
2. Interpret series capacitive circuits.
3. Interpret parallel capacitive circuits.
4. Analyze circuit applications of capacitors.
5. Interpret capacitive circuits.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	215	215

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY CAPACITANCE AND FREQUENCY

LEARNING STEPS

1. Read resource #1 to learn about capacitance in AC circuits.
2. Read resource #2 to learn the meanings of capacitive reactance, impedance, and phase angle.
3. Complete resource #3 to use this knowledge in determining the characteristics of RC circuits.
4. Complete resource #4 to test your comprehension of material.
5. Go to resource #5 on approval of instructor.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 104-107, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc. pp. 18-1 to 18-4, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 18-4 and 18-5, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 18-6 (see instructor for answer sheet).
5. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	215	215	001

MICRO - PERFORMANCE OBJECTIVE #2

INTERPRET SERIES CAPACITIVE CIRCUITS

LEARNING STEPS

1. Read resource #1 for the basics of series capacitive circuits.
2. View resource #2 to learn the characteristics of a series RC circuit.
3. Read resource #3 to learn to calculate capacitive reactance and voltages in series RC circuits.
4. Complete resource #4 to verify these calculations with measurements in actual circuits.
5. Complete resource #5 to test your knowledge of the material.
6. Proceed to resource #6 on instructor's approval.

RESOURCES

1. Electronics Basic Principles edited by Burke, Irvin and Mann, pp. 365 to 378, in LRC.
2. Video tape: #E/E-200-012 "Series RC Circuits" by T.I., in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 18-7 and 18-8, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 18-9 and 18-10, in LRC.
5. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 18-10 (see instructor for answer sheet).
6. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	215	215	002

MICRO - PERFORMANCE OBJECTIVE #3

INTERPRET PARALLEL CAPACITIVE CIRCUITS

LEARNING STEPS

1. View resource #1 to learn the characteristics of parallel RC circuits.
2. Read resource #2 to learn to calculate capacitive reactance in parallel circuits.
3. Complete resource #3 to verify these calculations with measurements in actual circuits.
4. Complete resource #4 to test your knowledge of the material.
5. Go to resource #5 on instructor's approval.

RESOURCES

1. Video tapes: #E/E-200-014 "Parallel RC Circuits" and E/E-200-020 "Parallel RC Circuits" by T.I., in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 18-11 and 18-12, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 18-12 to 18-14, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 18-14, (see instructor for answer sheet).
5. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	215	215	003

MICRO - PERFORMANCE OBJECTIVE #4

ANALYZE CIRCUIT APPLICATIONS OF CAPACITORS

LEARNING STEPS

1. View resource #1 to learn how to analyze RC circuits.
2. Read resource #2 to learn how capacitors are used in electrical/electronic circuits.
3. Complete resource #3 to observe these uses in practical circuits.
4. Complete resource #4 to test your comprehension of material.
5. Proceed to resource #5 on approval of instructor.

RESOURCES

1. Video tape: #E/E-200-015 "RC Circuit Analysis" by T.I., in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 18-15 and 18-16, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures/Optimal Procedure pp. 18-16 to 18-18, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 18-19 (see instructor for answer sheet).
5. MPO #5, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	215	215	004

MICRO - PERFORMANCE OBJECTIVE #5

INTERPRET CAPACITIVE CIRCUITS

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-4, this guide.
2. Criterion exam #E/E-100-215 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	215	215	005



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A LEARNING GUIDE

Task

INTERPRET RLC CIRCUITS

Purpose

Different RLC circuits are used every time you change television channels or tune in a station on your radio. This guide will enable you to understand how different arrangements of inductors, capacitors and resistors produce these different results.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	218	16 hours	215

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, INTERPRET RLC CIRCUITS. TO MASTER THIS TASK YOU MUST SCORE 16 OUT OF 20, OR 80%, ON THE CRITERION EXAM.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify series RLC circuits.
2. Identify parallel RLC circuits.
3. Interpret resonance.
4. Interpret source impedance.
5. Interpret RLC circuits.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	218	218

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY SERIES RLC CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the basics of a series RLC circuit.
2. View resource #2 to learn how to compare voltages across components and give vector proof.
3. View resource #3 to learn the basics of phasor algebra used in calculating resistive and reactive circuits.
4. Read resource #4 to learn how to calculate electrical quantities in series RLC circuits.
5. Complete resource #5 using these calculation methods to solve various circuits.
6. Complete resource #6 to test your comprehension of material.
7. Proceed to resource #7 on instructor's approval.

RESOURCES

1. Electronics Basic Principles edited by Burke, Irvin and Mann pp. 615-628, in LRC.
2. Filmstrip/cassette: #E/E-200-041 "Inductors and Capacitors in AC Circuits" by Bergwall, in LRC.
3. Video tape: #E/E-200-025 "Phasor Algebra" and E/E-200-026 "Series Resistive and Reactive Circuits" by T.I., in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 19-1 to 19-3, in LRC.
5. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 19-3 and 19-4, in LRC.
6. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 19-4 (see instructor for answer sheet).
7. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	218	218	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY PARALLEL RLC CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the basics of parallel RLC circuits.
2. View resource #2 to learn how to analyze parallel RLC circuits.
3. Read resource #3 to learn how to calculate various electrical quantities in parallel RLC circuits.
4. Complete resource #4 using these calculation methods to solve various circuits.
5. Complete resource #5 to test your knowledge of the material.
6. Go to resource #6 on instructor's approval.

RESOURCES

1. Electronics Basic Principles edited by Burke, Irvin and Mann, pp. 628-642, in LRC.
2. Video tapes: #E/E-200-027 "Complex RLC Circuit Analysis" and E/E-200-028 "Parallel Restrictive Circuits" by T.I., in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc., p. 19-5, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 19-6, in LRC.
5. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 19-7 (see instructor for answer sheet).
6. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	218	218	002

MICRO - PERFORMANCE OBJECTIVE #3

INTERPRET RESONANCE

LEARNING STEPS

1. Read resource #1 to learn why resonance is reached when $X_L = X_C$.
2. View resource #2 to learn circuit characteristics at resonance.
3. Read resource #3 to learn the characteristics of series and parallel resonance.
4. Complete resource #4 calculating various circuit quantities for series and parallel resonance circuits.
5. Complete resource #5 to test your comprehension of this material.
6. Proceed to resource #6 on instructor's approval.

RESOURCES

1. Electricity and Electronics, by Gerrish and Dugger, pp. 111-124, in LRC.
2. Video tapes: #E/E-200-029 "Pesonance" and E/E-200-030 "Pesonance" by T.I., in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 19-8 to 19-13, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures p. 19-13, in LRC.
5. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 19-14 (see instructor for answer sheet).
6. MIO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	218	218	003

MICRO - PERFORMANCE OBJECTIVE #4

INTERPRET SOURCE IMPEDANCE

LEARNING STEPS

1. Read resource #1 to learn the importance of source impedance and how to measure it.
2. Complete resource #2 measuring the impedance of an AC power supply.
3. Complete resource #3 to test your knowledge of this material.
4. Go to resource #4 on instructor's approval.

RESOURCES

1. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 19-15 and 19-16, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 19-16 and 19-17, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions pp. 19-17 and 19-18 (see instructor for answer sheet).
4. MFO #5, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	218	218	004

MICRO - PERFORMANCE OBJECTIVE #5

INTERPET PLC CIRCUITS

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-4, this guide.
2. Criterion exam #E/E-100-218 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	218	218	005



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A LEARNING GUIDE

Task COMPUTE AC POWER

Purpose Different values of resistance, inductance and capacitance have an effect on the power factor of a circuit, which can result in erroneous power billings by the power company. This guide will enable the electrician/electronics technician to determine the correct power factor of AC circuits.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	221	16 hours	218

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, COMPUTE AC POWER. TO MASTER THIS TASK YOU MUST SCORE 16 OUT OF 20, OR 80%, on the criterion exam.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify resistive circuits.
2. Interpret series reactive circuits.
3. Interpret parallel reactive circuits.
4. Compute AC power.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	221	221

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY RESISTIVE CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn the characteristics of resistive circuits.
2. Read resource #2 to learn the values of AC power in resistive circuits.
3. Complete resource #3, using this information in practical circuit measurements and calculations.
4. Complete resource #4 to test your understanding of the material.
5. Proceed to resource #5 on instructor's approval.

RESOURCES

1. Electricity and Electronics by Gerrish and Dugger, pp. 89-94 and pp. 104 to 107, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 20-1 to 20-3, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 20-3 and 20-4, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 20-5 (see instructor for answer sheet).
5. M.O #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	221	221	001

MICRO - PERFORMANCE OBJECTIVE #2

INTERPRET SERIES REACTIVE CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn how to calculate various values concerned with AC power in series circuits.
2. Complete resource #2 to verify these calculations with measurements from RL and RC series circuits.
3. Complete resource #3 to test your comprehension of the material.
4. Go to resource #4 on approval of instructor.

RESOURCES

1. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 20-6 to 20-8, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 20-9 and 20-10, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 20-10 (see instructor for answer sheet).
4. MFO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	221	221	002

MICRO - PERFORMANCE OBJECTIVE #3

INTERPPET PARALLEL REACTIVE CIRCUITS

LEARNING STEPS

1. Read resource #1 to learn calculation of AC power in parallel circuits.
2. Complete resource #2 to verify calculations with circuit measurements.
3. Complete resource #3 to test your knowledge of this material.
4. Proceed to resource #4 on instructor's approval.

RESOURCES

1. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 20-11 and 20-12, in LPC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures p. 20-12, in LPC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 20-13 (see instructor for answer sheet).
4. MFO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	221	221	003

MICRO - PERFORMANCE OBJECTIVE #4

COMPUTE AC POWER

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-3, this guide.
2. Criterion exam: #E/E-100-221 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	221	221	004



COMPETENCY—BASED INDIVIDUALIZED VOCATIONAL EDUCATIONAL CONSORTIUM

CIVEC
301 N. Swift Road
Addison, Illinois 60101
312/620-8770

Produced By
A. J. Eggett
VOTEC
Catlin Road
Danville, IL 61832

A LEARNING GUIDE

Task DEFINE SEMICONDUCTORS

Purpose Semiconductor diodes and transistor applications are expanding and are not only replacing the vacuum tube functions, but are also producing a new electronic technology. This guide will enable you to interpret the functions of the semiconductor diode and the operation of the PNP and NPN transistors.

BASIC ELECTRICITY/ELECTRONICS

Program	Task	Est. Time	Prereq.
100	239	16 hours	230

5/82

LEARNING CONTRACT

1 STUDENT DATA

NAME

16 hours

SOCIAL SECURITY NUMBER

LENGTH OF CONTRACT (NORMAL TIME IN HOURS)

2 TERMINAL PERFORMANCE OBJECTIVE

GIVEN A WRITTEN TEST, IDENTIFY THE N-TYPE AND P-TYPE MATERIALS, THE PN JUNCTION DIODE, THE JUNCTION DIODE AS A RECTIFIER, NPN JUNCTION TRANSISTOR AND THE PNP/NPN JUNCTION TRANSISTORS. MASTERY WILL BE DEMONSTRATED BY PASSING A WRITTEN CRITERION EXAM WITH A MINIMUM SCORE OF 80%.

2a MICRO—PERFORMANCE OBJECTIVE(S)

1. Identify the N-type and P-type materials.
2. Identify the PN junction diode.
3. Interpret the junction diode as a rectifier.
4. Interpret the NPN junction transistor.
5. Identify the PNP/NPN junction transistors.
6. Define semiconductors.

3 AGREEMENT

I, _____ agree to complete the above stated terminal performance requirement within _____ to _____. I further recognize that the conditions of the contract (performance and time agreement) report my ability to perform the requirements of the occupation and record my progress.

Student's Signature

DEPT	PROG	TASK	TPO
E/E	100	239	239

Instructor's Signature
(verifies competency)

MICRO - PERFORMANCE OBJECTIVE #1

IDENTIFY THE N-TYPE AND P-TYPE MATERIALS

LEARNING STEPS

1. Read resource #1 to learn the characteristics of semiconductor materials.
2. Read resource #2 to learn the basics of semiconductor materials.
3. Read resource #3 to learn how N-type and P-type semiconductor sections are made.
4. Complete resource #4 to test your comprehension of the material.
5. Proceed to resource #5 on instructor's approval.

RESOURCES

1. Electronics, Circuits and Applications edited by Burke, Irvin and Mann, pp. 129 to 139, in LRC.
2. Electricity and Electronics by Gerrish and Dugger, pp. 159 to 164, in LRC.
3. Electricity Concepts Unit II, by Energy Concepts, Inc., pp. 24-1 to 24-3 in LRC.
4. Electricity Concepts Unit II, by Energy Concepts, Inc. Questions p. 24-3 (see instructor for answer sheet).
5. MPO #2, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	001

MICRO - PERFORMANCE OBJECTIVE #2

IDENTIFY THE PN JUNCTION DIODE

LEARNING STEPS

1. Read resource #1 to learn the basic configuration of a diode.
2. Read resource #2 to learn how diode rectifiers are made, and how forward/reverse bias affect the operation.
3. Complete resource #3, connecting diode circuits, and observing their rectifying actions.
4. Complete resource #4 to check your understanding of the material.
5. Go to resource #5 on instructor's approval.

RESOURCES

1. Electronics, Circuits and Applications edited by Burke, Irvin and Mann, pp. 140-143, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 24-4 to 24-6, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures p. 24-7, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 24-8 (see instructor for answer sheet).
5. MPO #3, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	002

MICRO - PERFORMANCE OBJECTIVE #3

INTERPRET THE JUNCTION DIODE AS A RECTIFIER

LEARNING STEPS

1. Read resource #1 to learn how diodes rectify.
2. Read resource #2 to learn how semiconductor diodes function in power supply circuits.
3. Complete resource #3, connecting half-wave and full-wave rectifier circuits, observing their operation.
4. Complete resource #4 to test your understanding of the material.
5. Proceed to resource #5 on instructor's approval.

RESOURCES

1. Electronics, Circuits and Applications by Burke, Irvin and Mann, pp. 144-150, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 24-9 and 24-10, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 24-10 to 24-12, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions pp. 24-12 and 24-13, (see instructor for answer sheet).
5. MPO #4, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	003

MICRO - PERFORMANCE OBJECTIVE #4

INTERPRET THE NPN JUNCTION TRANSISTOR

LEARNING STEPS

1. Read resource #1 to learn the characteristics of NPN junction transistors.
2. Read resource #2 to learn how NPN transistors are made/operate.
3. Complete resource #3, observing NPN transistor circuit action.
4. Complete resource #4 to test your comprehension of the material.
5. Proceed to resource #5 on instructor's approval.

RESOURCES

1. Electronics, Circuits and Applications edited by Burke, Irvin and Mann, pp. 151-156, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 24-14 and 24-15, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 24-15 and 24-16, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions p. 24-17, (see instructor for answer sheet).
5. MFO #5, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	004

MICRO - PERFORMANCE OBJECTIVE #5

IDENTIFY THE PNP/NPN JUNCTION TRANSISTORS

LEARNING STEPS

1. Read resource #1 to learn the characteristics of PNP/NPN junction transistors.
2. Read resource #2 to learn how PNP transistors are made, and how they operate as amplifiers.
3. Complete resource #3, connecting a two-transistor circuit, making measurements and calculating gains of the transistor.
4. Complete resource #4 to test your comprehension of the material.
5. Go to resource #5 on instructor's approval.

RESOURCES

1. Electricity, Circuits and Applications by Burke, Irvin and Mann, pp. 156-164, in LRC.
2. Electricity Concepts, Unit II, by Energy Concepts, Inc., pp. 24-18 and 24-19, in LRC.
3. Electricity Concepts, Unit II, by Energy Concepts, Inc. Procedures pp. 24-19 and 24-20, in LRC.
4. Electricity Concepts, Unit II, by Energy Concepts, Inc. Questions, p. 24-21 (see instructor for answer sheet).
5. MPO #6, this guide.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	005

MICRO - PERFORMANCE OBJECTIVE #6

DEFINE SEMICONDUCTORS

LEARNING STEPS

1. Review resource #1 to prepare for criterion exam.
2. Complete resource #2 to check your understanding of this task.
3. Return packet to resource #3.

RESOURCES

1. MPO #1-5, this guide.
2. Criterion exam: #E/E 100-239 from instructor.
3. Instructor.

DEPT	PROG	TASK	TPO	MPO
E/E	100	239	239	006